

GSA TODAY

VOL. 13, No. 10

A PUBLICATION OF THE GEOLOGICAL SOCIETY OF AMERICA

OCTOBER 2003

Mid-continental magnetic declination: A 200-year record starting with Lewis and Clark

Inside:

**Mid-continental magnetic declination:
A 200-year record starting with Lewis
and Clark** Robert E. Criss, p. 4

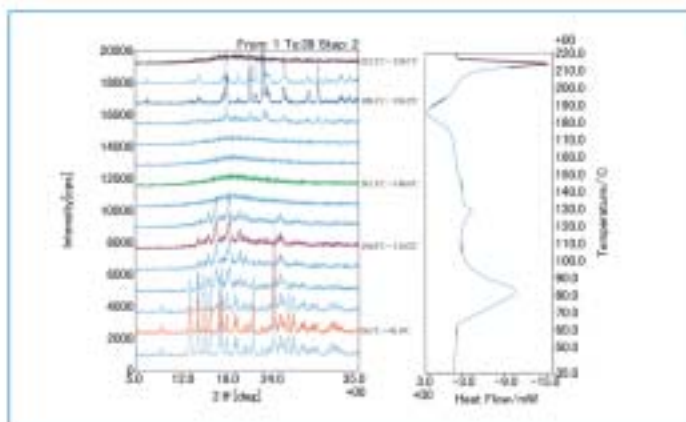
North-Central Section Meeting, p. 44

Call for Committee Service, p. 46

**Call for Nominations, GSA Awards
and Medals**, p. 49

Leading With Innovation

XRD-DSC



Simultaneous XRD
and DSC for geological
applications

Simultaneous collection of XRD and DSC data eliminates the uncertainty of separate measurements. With the addition of a humidity generator, the XRD-DSC system provides the ability to study crystalline-amorphous and amorphous-amorphous changes at constant temperature and variable humidity or variable humidity at constant temperature.

- Enables simultaneous characterization of dehydration, polymorphic phase transitions, melting, crystallization, and decomposition of geological samples
- Distinguishes exothermic and endothermic reactions and provides their enthalpies and temperatures
- Probes the effects of temperature history and heat treatment on structural and thermal properties
- Requires only milligrams of sample
- Humidity attachment for hydration studies

**Contact Rigaku/MSC today for all for
your XRD needs!**

www.RigakuMSC.com
phone: 281-363-1033 fax: 281-364-3628 e-mail: info@RigakuMSC.com

Rigaku

GSA TODAY

GSA TODAY publishes news and information for more than 17,000 GSA members and subscribing libraries. *GSA Today* lead science articles should present the results of exciting new research or summarize and synthesize important problems or issues, and they must be understandable to all in the earth science community. Submit manuscripts to science editors Keith A. Howard, khoward@usgs.gov, or Gerald M. Ross, gross@NRCAn.gc.ca.

GSA TODAY (ISSN 1052-5173 USPS 0456-530) is published 11 times per year, monthly, with a combined April/May issue, by The Geological Society of America, Inc., with offices at 3300 Penrose Place, Boulder, Colorado. Mailing address: P.O. Box 9140, Boulder, CO 80301-9140, U.S.A. Periodicals postage paid at Boulder, Colorado, and at additional mailing offices. Postmaster: Send address changes to *GSA Today*, GSA Sales and Service, P.O. Box 9140, Boulder, CO 80301-9140.

Copyright © 2003, The Geological Society of America, Inc. (GSA). All rights reserved. Copyright not claimed on content prepared wholly by U.S. government employees within scope of their employment. Individual scientists are hereby granted permission, without fees or further requests to GSA, to use a single figure, a single table, and/or a brief paragraph of text in other subsequent works and to make unlimited photocopies of items in this journal for noncommercial use in classrooms to further education and science. For any other use, contact Copyright Permissions, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA, Fax 303-357-1073, editing@geosociety.org; reference *GSA Today*, ISSN 1052-5173. Permission is granted to authors to post the abstracts only of their articles on their own or their organization's Web site providing the posting includes this reference: "The full paper was published in the Geological Society of America's journal *GSA Today*, [include year, month, and page numbers if known, where the article will appear]." GSA provides this and other forums for the presentation of diverse opinions and positions by scientists worldwide, regardless of their race, citizenship, gender, religion, or political viewpoint. Opinions presented in this publication do not reflect official positions of the Society.

SUBSCRIPTIONS for 2003 calendar year: Society Members: *GSA Today* is provided as part of membership dues. Contact GSA Sales and Service at 1-888-443-4472, (303) 447-2020, option 3, or gsaservice@geosociety.org for membership information. Nonmembers & Institutions: Free with paid subscription to both *GSA Bulletin* and *Geology*, otherwise \$65 for U.S., Canada, and Mexico; \$75 elsewhere. Contact Subscription Services at (800) 627-0629 or gsa@allenpress.com. Also available on an annual CD-ROM (together with *GSA Bulletin*, *Geology*, GSA Data Repository, and an Electronic Retrospective Index to journal articles from 1972); \$99 to GSA Members, others call GSA Subscription Services for prices and details. Claims: For nonreceipt or for damaged copies, members contact GSA Sales and Service; all others contact Subscription Services. Claims are honored for one year; please allow sufficient delivery time for overseas copies, up to six months.

GSA TODAY STAFF:

Executive Director: John W. Hess

Science Editors: Keith A. Howard, U.S. Geological Survey, MS 919, Menlo Park, CA 94025, USA, khoward@usgs.gov; and Gerald M. Ross, Geological Survey of Canada, 3303 33rd Street NW, Calgary, AB T2L 2A7, Canada, gross@NRCAn.gc.ca

Director of Publications: Jon Olsen

Managing Editor: Jeanette Hammann, jhammann@geosociety.org

Editorial Staff: Matt Hanauer and Kristen Asmus

Production Coordinator: Margo Y. Sajban

Graphics Production: Margo Y. Sajban

ADVERTISING:

Classifieds & display: Ann Crawford, 1-800-472-1988, ext. 1053, (303) 357-1053, Fax 303-357-1070; acrawford@geosociety.org

GSA ONLINE: www.geosociety.org

Printed in U.S.A. using pure soy inks.

VOLUME 13, NUMBER 10

OCTOBER 2003

Cover: Part of the map resulting from the Lewis and Clark expedition of 1803-1806, showing the Rocky Mountains, the confluence of the Yellowstone and Missouri Rivers, and other geographic features (map copied in 1814 by Samuel Lewis from William Clark's original drawing). Instrument is an octant. **Right:** William Clark's Whitney pocket compass. Map and compass images courtesy of the Library of Congress, Geography and Map Division. See "Mid-continental magnetic declination: A 200-year record starting with Lewis and Clark," by Robert E. Criss, p. 4-11.



SCIENCE ARTICLE

- 4 **Mid-continental magnetic declination: A 200-year record starting with Lewis and Clark** ROBERT E. CRISS

13 **Geoscience Horizons: Seattle 2003**

- 14 **Speaker Ready Room Hours of Operation Extended!**
14 **Technical Program**
30 **Graduate Student Information Forum**
30 **Registration**
31 **Travel & Transportation**
33 **Guest Program**
34 **Seattle Hotels**
36 **Convention & Trade Center floor plans**
41 **Hot Topics**
41 **Pardee Keynote Symposia**

- 43 **Media Relations Generates Coverage**

- 44 **Preliminary Announcement and Call for Papers:** North-Central Section Meeting

- 46 **Call for GSA Committee Service**

- 49 **Call for Nominations: GSA Awards and Medals**

- 53 **Notice of Council Meeting**

- 53 **2004 Student Research Grants**

- 55 **Call for Applications:** 2004-2005 GSA-U.S. Geological Survey Congressional Science Fellow

- 56 **2004 GeoVentures**

- 57 **Call for Geological Papers:** 2004 GSA Section Meetings

- 58 **Classified Advertising**

- 62 **GeoMart Geoscience Directory**

Mid-continental magnetic declination: A 200-year record starting with Lewis and Clark

Robert E. Criss, Department of Earth & Planetary Sciences, Washington University, St. Louis, Missouri, USA

ABSTRACT

Compass and sextant observations by Meriwether Lewis and William Clark are combined to provide the oldest determinations of the magnetic declination in the continental interior of the United States. Over the past 200 years, the magnetic declination near St. Louis has changed from an azimuth of 7.7° east to 0° today. The 1803–1806 declinations are essential to interpreting the travel legs made by Lewis and Clark on their historic journey, and could be used to test and improve existing magnetic models.

INTRODUCTION

Included in Jefferson's ambitious charge to Lewis and Clark for their historic expedition of 1803–1806 was the

requirement that they make, with "great pains and accuracy," astronomical measurements to determine the latitude and longitude of all remarkable points along the way (e.g., Preston, 2000). To accomplish this, Lewis received training in the methods of celestial navigation and acquired a sextant, an octant, a "circumferentor" or large-diameter surveyor's compass, and a chronometer that was somewhat troublesome but good for its day (Moulton, 1986–1993). Most of the original instruments have been lost, but all were ably described by Lewis in his 22 July 1804 journal entry (Moulton, 1986–1993, v. 2, p. 410–413). For historical reasons, the data for longitude were not reduced until recently (Preston, 2000), and the calculations for latitude that were made in the field by Lewis

and Clark contain variable, small to significant errors that are understandable given the circumstances.

To date, the interest in these observations has been restricted to their primary intended purpose, which was that of determining position. However, Jefferson also required the explorers to note the "variations of the compass" in different locations, and the requisite data were indeed acquired in cases where both compass and sextant were used to make observations. These data seem likewise not to have been reduced before, even though they contain a valuable record of magnetic declination across the United States in the early 1800s. This paper details several different methods whereby this record may be reduced.

Importance of Magnetic Declination

Earth's magnetic field approximates a dipole, though the magnetic north and south poles are neither fixed nor do they coincide with Earth's geographic poles. Nevertheless, the utility of magnetized needles in aiding travelers, mariners, and miners to determine north has probably been known for millennia, although the earliest written reference to the compass may be by Alexander Neckam ca. 1187 A.D. (Hoover and

TABLE 1. MAGNETIC DECLINATION IN 1803–1805 FROM POLARIS AND SOLAR MEASUREMENTS COMPARED TO 2003

Date	Lat	Long	Polaris ¹ Mag. Azimuth	Location	M.D. ² Polaris	M.D. ³ Eq. 3 best est.	M.D. ⁴ Eq. 2	BGS ⁵ Model	2003 ⁶ M.D.	Moulton vol./page ⁷
Dec. 2 & 3, 1803	37.99°	89.95°	7.8°	Kaskaskia, Illinois	7.8°	7.4°	7.7°	7.60°	−0.23°	2/119
June 1, 1804	38.56°	92.03°	7°	Osage River, Missouri	7.9°			8.36°	1.37°	2/269
June 2, 1804	"	"	6.2°	"	7.6°	8.2°	7.2°			"
June 20, 1804	39.18°	93.94°	7.9°	Lafayette County, Missouri	9.7°	NA	NA	9.06°	2.82°	2/311
June 27, 1804	39.12°	94.61°	8°	Kansas River, Missouri	9.4°	10.2°	10.3°	9.31°	3.33°	2/326
"	"	"	8°	"	9.4°					"
"	"	"	7.8°	"	9.1°					"
June 9, 1805	47.93°	110.48°	15°	Marias River, Montana	16.7°	17.1°	17.0°	16.39°	14.50°	4/274
July 29, 1805	45.93°	111.50°	13°	Three Forks, Montana	14.7°	16.1°	16.6°	15.91°	14.47°	5/13

1. Magnetic azimuth of Polaris on indicated date, as measured by Lewis and Clark.

2. Magnetic declination in 1803–1805, calculated from Polaris and corrected for the time of measurement.

3. Magnetic declination in 1803–1805, calculated with eq. 3 from the Sun's position and the latitude (Table 2; see footnote 1).

4. Magnetic declination in 1803–1805, calculated with eq. 2 from the Sun's position and the time (Table 2; see footnote 1).

5. Magnetic declination in 1803–1805, calculated from model Bgs1800 (U.S. Geological Survey, 2003).

6. Magnetic declination in 2003, calculated from model IGRF-2000 (U.S. Geological Survey, 2003).

7. Volume and page number of Moulton (1986–1993) providing Lewis and Clark data.

Hoover, 1950). Recognition that magnetic north deviates from true north and that the magnitude of this deviation varies both geographically and temporally led to the establishment of several magnetic observatories to facilitate global exploration. Nearly continuous records of the secular variation of declination have been available since ca. 1570 A.D. for selected sites such as London (Malin and Bullard, 1981). Numerous ship captains augmented this record and hundreds of thousands of observations at sea have been compiled (Jackson et al., 2000), but before ca. 1850, little data existed for the North American interior.

Accurate knowledge of the declination and its variations has numerous applications apart from its importance to navigation at any given place and time, somewhat analogous to the way that today's local weather relates to the extensive records essential to the field of climatology. Historical magnetic measurements can be used to study the variations of Earth's magnetic field and represent one of very few observable manifestations of the complex and evolving processes occurring in Earth's core (e.g., Bloxham, 1995). Of immediate interest here is that knowledge of historical declinations is commonly needed to interpret the observations of early natural scientists. For example, many important early maps of underground mine workings (e.g., Becker,

1882) are oriented relative to magnetic north at the time, as a compass is especially handy when it is impossible to see the Sun or the stars. Similarly, knowledge of the magnetic declination during the Lewis and Clark expedition is needed to understand their sketch maps and the individual travel legs that they report in terms of compass bearings (see below).

Magnetic models for the past 400 years are available but their accuracy depends on both the distribution and quality of available historical data (Jackson et al., 2000; U.S. Geological Survey, 2003). In this regard, Lewis and Clark's observations yield the first determinations of declination in the interior of North America, and the accuracy of those determinations appears to be better than that typical for the period. First, Lewis and Clark's detailed notes define their observational positions much more accurately than those possible out at sea, where determinations of longitude depended on chronometers and were generally good only to the nearest 30'. Moreover, a method is adopted below wherein these accurate positions are used in lieu of the hour angle to *calculate* the declination associated with that position. Lewis and Clark's declinations therefore provide a useful test of the accuracy of available magnetic models for the early 1800s. It will be shown that the declinations determined from

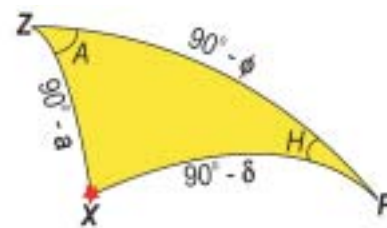


Figure 1. The “astronomical triangle” has legs of great circle arcs on the celestial sphere that connect the observer’s zenith (Z), Earth’s rotational pole (P), and the Sun or star of interest (X). The angular arc lengths are the respective complements of the observer’s latitude (ϕ), the star’s altitude (a) relative to the observer’s horizon, and the star’s declination (δ) relative to the celestial equator as given in the ephemeris tables. Internal angle H is the hour angle, and A is the true azimuth of the object as seen by the observer. Equations 2–4 are derived by applying the spherical laws of sines and cosines to this spherical triangle. Simplified after Smart (1977).

Lewis and Clark’s data are systematically greater than those calculated from the latest readily available magnetic models for their place and date by an average of 0.5° and, in some locations, by in excess of a degree.

METHODS AND CALCULATIONS

Correction of Raw Field Data

Lewis and Clark utilized standard methods to measure the magnetic azimuth and altitude of the Sun, or alternatively the magnetic azimuth of Polaris, at times recorded by their chronometer.



Figure 2. A: Magnetic declination calculated from the solar measurements of Lewis and Clark (bold numbers, Table 2; see footnote 1), based on the latitude and site of observation as determined from their narrative and by comparing modern and historic maps. Numbers represent averages whenever possible, and those given in parentheses indicate irregularities in the reported data; see Table 2 for details. Non-bold numbers represent magnetic declinations utilizing Polaris data (Table 1). Contours are schematic and are based solely on the plotted data. The regular westward increases in magnetic declination strongly support the accuracy of Lewis and Clark’s observations. Locations discussed in the text are K—Kaskaskia, Illinois (Fig. 3); BB—Big Bend, South Dakota (Fig. 4); CD—Cape Disappointment, Washington (Fig. 5). **B.** Magnetic declination calculated for March 2003 utilizing model IGRF-2000 (U.S. Geological Survey, 2003). The agonic line currently passes through St. Louis County, far west of its location in coastal Virginia ca.1803–1806.

The azimuthal measurements by compass, adjusted by a spirit level, are direct readings that appear to be accurate to a quarter of a degree, though they are commonly reported only to the nearest degree. These simple measurements need no additional comment, except that in rare cases, the compass quadrant appears to have been incorrectly read or recorded (e.g., S85°E is actually N85°E).

The sextant measurements also are straightforward but require a few corrections, many of which are mentioned by Lewis in the 22 July 1804 entry or illustrated in Clark's example calculations for latitude (e.g., see the 19 December 1803 entry; Moulton, 1986–1993, v. 2, p. 137). First, angular measure was made between the Sun and its reflected image from an "artificial horizon" (water surface), so the angle recorded is exactly twice the apparent altitude above the real horizon. Half the measured angle (b) must be reduced by the standing error of the sextant, which Lewis reports is 8'45" (see 22 July 1804 entry), and this result corrected for atmospheric refraction and parallax per appropriate tables (e.g., Bowditch, 1939). Alternatively, the total angular correction in degrees is approximately:

$$\text{Correction} = -0.01597/\tan b + 0.00244 \cos b - 0.14583 \quad (1)$$

where the first term on the right is the correction for refraction, the second term the correction for parallax, and the third term the standing error of the sextant. Thus, half the measured angle plus this adjustment will correct the altitude, if above 15°, to better than $\pm 0.00056^\circ$ (2 seconds), which is better than the precision of measurement. One final correction is commonly needed, as measure was for convenience most commonly made of the altitude of either the "upper limb" or "lower limb" of the Sun rather than of its center. The solar semi-diameter, which is $\sim 0.267^\circ$ but for any day is accurately given in the ephemeris tables (Maskelyne, 1803; Garnet, 1804, 1805a, 1805b), needs to be respectively subtracted or added to obtain the true altitude of the Sun's center. This correction was occasionally troublesome for the explorers, possibly because one of the two instrument telescopes inverted the image (see 22 July 1804 entry). For example, Clark's calculations of latitude for "Camp Dubois" on 18–20 December 1803 are too low by about half a degree. It is likely that the semi-diameter was

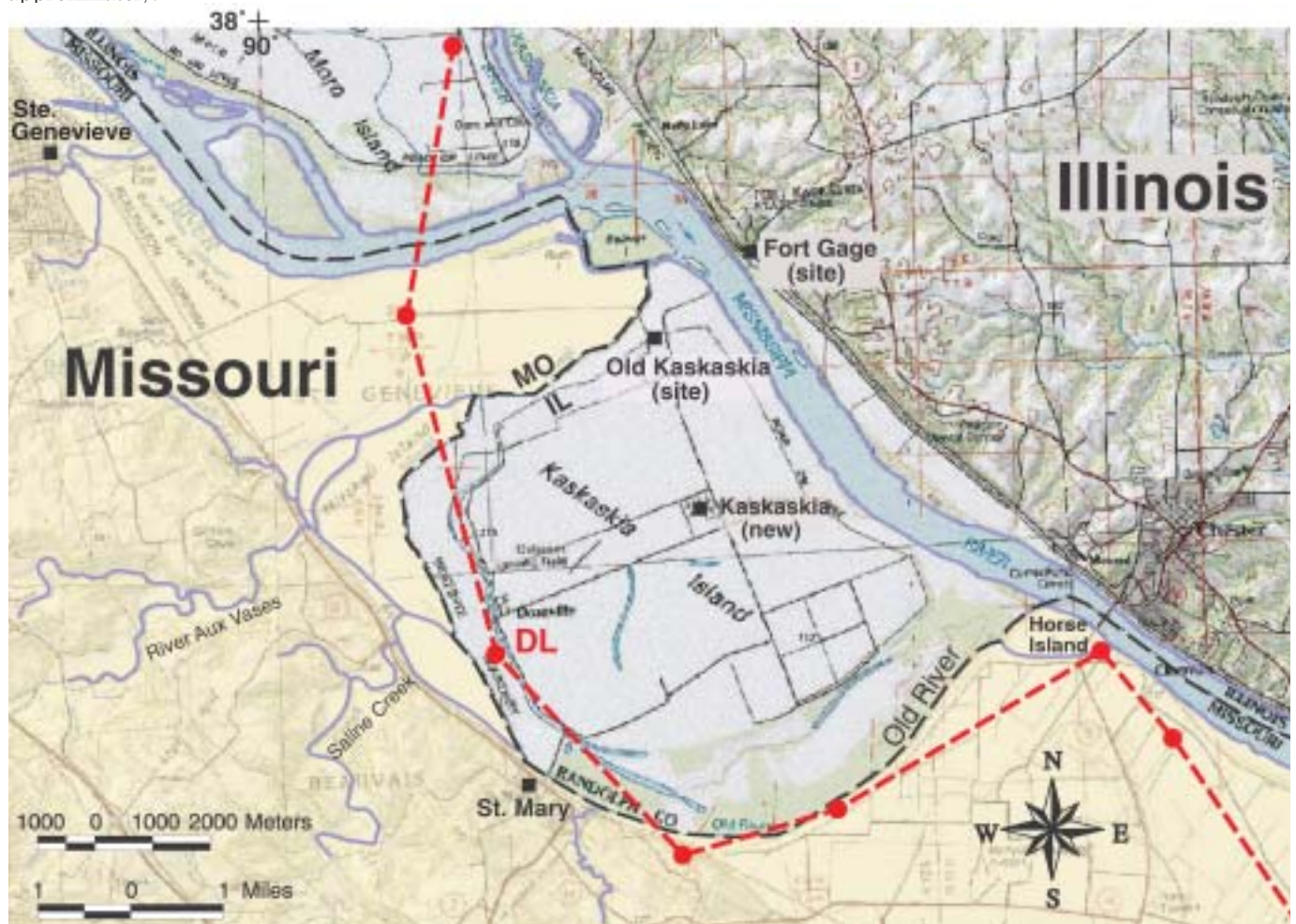


Figure 3. Map of Kaskaskia Island (K, Fig. 2A) and vicinity, Illinois (gray and green background) and Missouri (yellow background). On 27 November 1803, Lewis and Clark camped on the "lower point of the horse Island," situated at that time at the confluence of the Kaskaskia and the Mississippi Rivers. The red dots and dotted line mark the travel legs of the boat as recorded by Clark in the journals but corrected for declination; the point marked DL indicates the projected location of Donohoes Landing. The Mississippi River shifted dramatically in this region during the flood of 1881, abandoning its early channel along the Old River whose course is marked by Clark's traverse and by the modern state boundary, and capturing the former valley of the lower Kaskaskia River. Kaskaskia Island remains part of Illinois even though it is west of the Mississippi River.

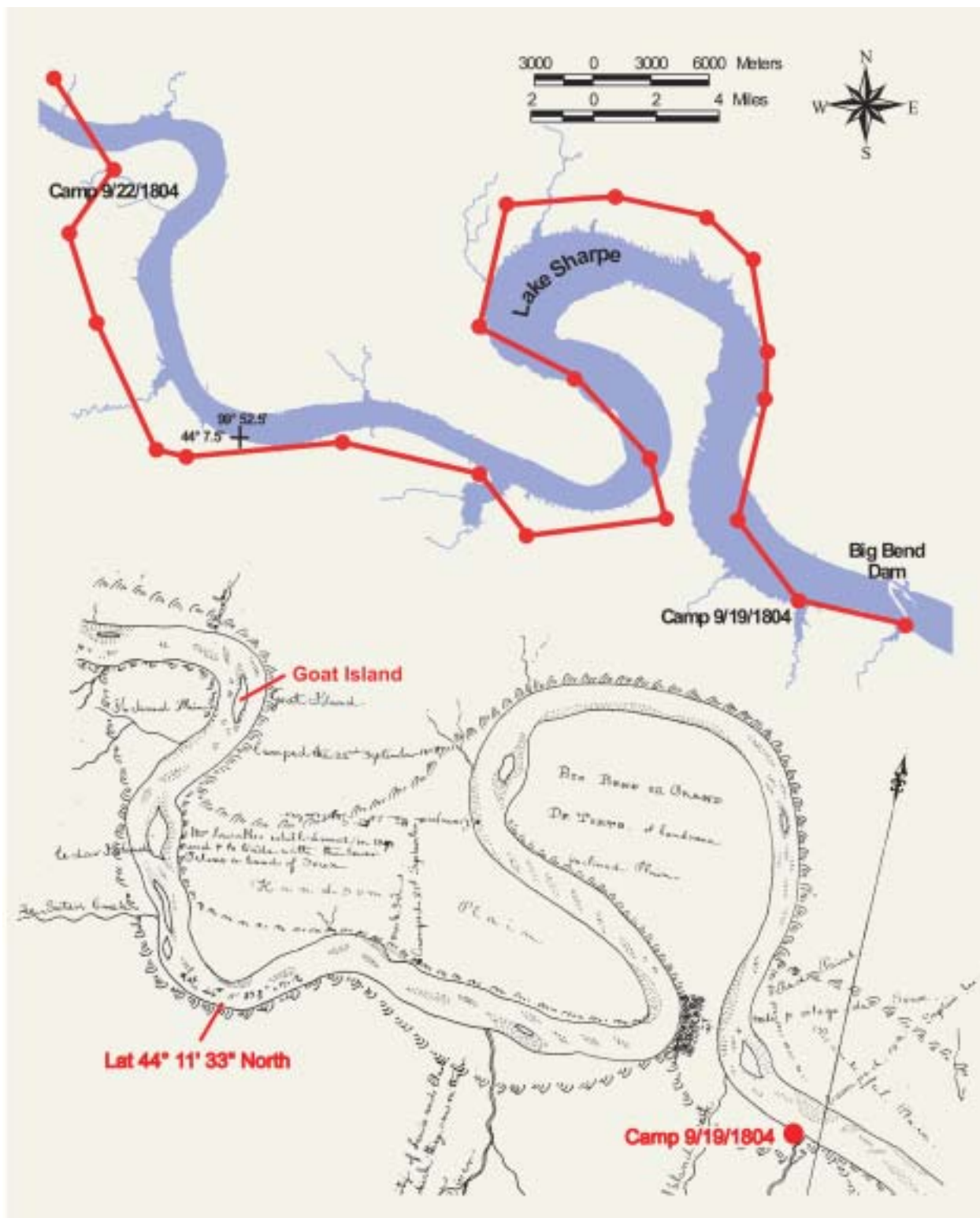


Figure 4. Map of the Big Bend on the Missouri River, central South Dakota (BB in Fig. 2A). The top illustration is a modern map showing Lake Sharpe impounded behind Big Bend Dam. Superimposed are a string of red dots representing the dead-reckoned distances and associated compass bearings for the travel legs reported by Lewis and Clark in the journals for 19–23 September. This string is rotated to account for a compass declination of 12.5° and is indexed to the well-constrained campsite of 19 September 1804. For example, the traverse from what is now Big Bend Dam to the 19 September campsite is reported as “due west 3.5 miles,” but plots as 3.5 miles to the N77.5°W. The lower sketch map is part of Clark-Maximilian sheet 11 (a copy of Clark’s original 1804 map which is now lost; Moulton, 1983), which has also been rotated by 12.5°. Note the prominent “north” arrow, which clearly represents magnetic north at this location in 1804; this arrow is orthogonal to the aforementioned, “due west 3.5 miles” traverse.

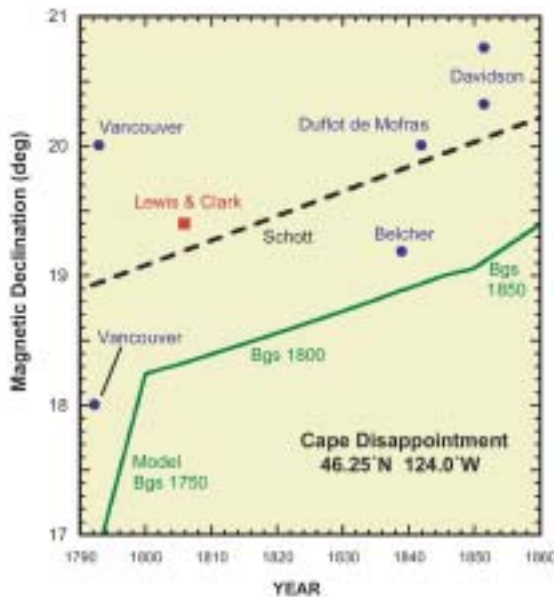


Figure 5. Historical shipboard measurements of the magnetic declination along the Pacific coast near Cape Disappointment, Washington (CD in Fig. 2A), starting with those by Captain George Vancouver in 1792 (Schott, 1856), are compared to Lewis and Clark's determination of 19.4° in 1805 (Table 2; see footnote 1). The dotted line is Schott's (1856) suggested trend for this site; the solid green line calculated from the Bgs models (U.S. Geological Survey, 2003) significantly underestimates the measured declinations.

unintentionally added instead of subtracted, and as a result, Clark's calculated latitude is too low by 0.544°.

Chronometers of the period were unreliable by today's standards, though on numerous days, Lewis and Clark made useful determinations of the apparent time of local noon by the "equal altitudes" method. In short, for a given angular setting of the sextant, sequential ante meridiem apparent times were recorded for the passages of the upper limb, center, and lower limb of the rising Sun. Then, for the same angle, post meridiem times were sequentially recorded for the passages of the setting Sun's lower limb, center, and upper limb. Three good estimates of local noon for that place and day can be made by averaging the three appropriate pairs of numbers, provided that the clock ran steadily during this interval. Suppose at some recorded clock time, the altitude and magnetic azimuth of the Sun were recorded. The "hour angle" for that measurement is accurately estimated by the hourly deviation from the interpolated noon clock time multiplied by 15°/hr (i.e., 360° per 24 hr).

Finally, the position of observation can be calculated from the measurements by several methods. For example, the latitude is easily calculated from the Sun's altitude at apparent noon given the appropriate solar declination from the ephemeris tables (Maskelyne, 1803; Garnet, 1804, 1805a, 1805b). For several reasons these determinations even for latitude are demonstrably not more accurate than ±5 min, and longitude error typically exceeds ±30 min (Preston, 2000). The latitude and longitude of the explorers at any time can be determined far more accurately by comparing their exhaustive notes for each travel leg with historical and modern maps (Moulton, 1983; Harlan, 2003).

Computational Methodology for Polaris

Lewis and Clark made several measurements of the "magnetic azimuth of Polaris" and recorded the time on their chronometer. If Polaris exactly coincided with Earth's rotational axis, then the magnetic azimuth would provide a direct measure of the magnetic declination for that location. Polaris does not precisely coincide with the rotational axis, so a second order correction is necessary.

At the present time (2003), the astronomical declination of Polaris is close to 89.28°, only about 43' from Earth's rotational pole. The latter deviation has decreased for millennia and will attain a minimum of 27' ca. 2100 A.D. In 1805, Polaris' deviation was far larger at 103.95' (Maskelyne, 1806), and subsequently it has decreased by ~0.303 min/yr. In 1805, Polaris could have been as much as 103.95' to either the east or the west of true North, depending on the time, as its apparent daily path described a circle about Earth's rotational pole with a proportionate radius.

Accurate calculation of true North from the position of Polaris can be made by simple trigonometry at any clock time, provided that the time of its "upper culmination" is known for that day. This latter time can be determined from Lewis and Clark's chronometer and the date plus the clock time at local noon. Also required are the right ascension of the Sun on that day, given in the ephemeris tables, and the right ascension of Polaris, which was 0 hr, 53 min, 25 sec in 1805 and has gradually increased to 2 hr, 34 min, 39 sec today. (The right ascension is the equivalent of longitude in the celestial coordinate system, but it is measured from 0 to 24 hr relative to the "first point of Aries," rather than in degrees from the prime meridian. For a more precise definition, see U.S. Naval Observatory, 2003.) Specifically, the local time of the upper culmination of Polaris differs from local noon by the difference between the Sun's right ascension and that of Polaris. Table 1 provides the magnetic declination in 1803–1805 for six locations using this method.

Computational Methodology for the Sun

The magnetic declination can also be determined by the difference between the measured magnetic azimuth and the true azimuth of the Sun at any time. There are two different means to combine the measurements of Lewis and Clark with ephemeris data to calculate this difference. Appropriate data were collected during 1803–1806 for 25 locations between the confluence of the Ohio and Mississippi Rivers and the Pacific Ocean.

Spherical trigonometry can be used to determine the true azimuth of the Sun from measured quantities of interest (Smart, 1977; U.S. Naval Observatory, 2003). Most remarkable are the spherical law of sines and two forms of the spherical law of cosines as applied to the "astronomical triangle," whose three apices are Earth's rotational pole, the observer's zenith, and the Sun, all connected by great circle arcs (Fig. 1). The spherical law of sines allows the true azimuth (A) to be calculated from the Sun's altitude (a) and declination (δ , from ephemeris tables) and the hour angle (H) of observation:

$$\sin A = \cos \delta \sin H / \cos a \quad (2)$$

This equation has the property of being independent of the latitude. Alternatively, the spherical law of cosines can be used to determine the true azimuth in terms of the Sun's

altitude and declination and the observer's latitude ϕ :

$$\sin \delta = \sin a \sin \phi + \cos a \cos \phi \cos A \quad (3)$$

which is independent of the hour angle (U.S. Naval Observatory, 2003). A complementary relationship relates the hour angle, latitude, altitude, and declination, independent of the azimuth:

$$\sin a = \sin \delta \sin \phi + \cos \delta \cos \phi \cos H \quad (4)$$

Used in conjunction with equation 2 and utilizing H simply as a parameter for computation, equation 4 can be used to readily calculate the apparent path (altitude vs. azimuth) of the Sun across the sky for any latitude for any day for which the solar declination is given. This calculation can be highly refined if further provision is made for the small variation in the solar declination during that day. However, in the following discussion equations 2 and 3 are used to calculate the true solar azimuth from two partially independent sets of input data (Tables 1 and 2¹).

Due to the periodicity of the trigonometric functions, ambiguity can arise in relating the quantity calculated for A , which normally varies from 0 to 90°, to the true azimuth of the Sun (or star), which conventionally varies from 0 to 360°. This complication relates to the geographic quadrant in which the Sun resides during early mornings and late afternoons in the spring and summer; no ambiguity can occur during fall and winter when the Sun resides from rise to set in the southeast or southwest quadrants. The ambiguity can be eliminated by calculating the complete altitude-azimuth path for the day of interest as discussed above, or more simply by comparing the magnitude of the measured altitude after correction to the quantity B , where:

$$B = \text{invcos} | \cos \delta \sin H | \quad (5a)$$

$$\text{or } B = \text{invsin} (\sin \delta / \sin \phi) \quad (5b)$$

and where the vertical brackets denote absolute values. Equations 5a and 5b

were respectively derived from equations 2 and 3 for a true azimuth of due east or due west. If the measured altitude (after correction) at a given hour angle is greater than B , then the Sun is somewhere in the south and the conventional azimuth associated with that solar position is the quantity $180 \pm A$. If the measured altitude is less than B , then the Sun lies to the north of an east-west line and the conventional azimuth simply equals $\pm A$ during the ante meridiem, and the quantity $360^\circ \pm A$ during the post meridiem.

RESULTS

1803–1806 Declinations

Lewis and Clark's measurements define the 1803–1806 magnetic declinations for 26 different locations across the continent (Tables 1 and 2; see footnote 1). The calculations of magnetic declination for locations based on the Sun's position, determined with equation 3 or equation 2, are provided in Table 2. The average determination for each location using the preferred equation 3 method is shown in Figure 2A, along with the six determinations based on Polaris. As seen on Figure 2A, the 1803–1806 magnetic declinations systematically increase to the west, from $\sim 7.7^\circ$ east along the middle Mississippi River to 19.4° at Cape Disappointment. The systematic variations attest to the great care with which Lewis and Clark made and recorded their observations. Shown for comparison (Fig. 2B) is the magnetic declination in 2003 across the western United States. The greatest change in declination has occurred along the middle Mississippi River as the agonic line (0° declination) currently passes through St. Louis County. This westward drift of the agonic line has apparently continued for more than two centuries, but more interesting is the concomitant small decrease in declination on the northwest coast. The contours of declination have become more compressed in the continental interior by westward drift, and their trend has become more northerly.

Most interesting of the early measurements are the six sites where the magnetic declination is based on the compass bearing of Polaris, which in five cases can be compared to the magnetic declination based on the position of the Sun along with either the clock time (eq. 2) or the latitude (eq. 3; Table 1).

Also tabulated are magnetic declinations calculated for each location at the actual date (1803–1806) according to British Geological Survey model Bgs1800, and for 2003 according to model IGRF-2000 (U.S. Geological Survey, 2003).

Good agreement is secured between the three different calculations of magnetic declination for 1803–1805 based on Lewis and Clark's data (Table 1). The agreement is excellent considering that the determinations invariably depend on the compass bearing of either Polaris or the Sun, and these measurements, while occasionally reported by Lewis and Clark to the nearest 1/4 degree, were more commonly reported only to the nearest degree. Nevertheless, the calculations for magnetic declination are reported here to the nearest tenth of a degree in all cases, which is justified because the precision is occasionally this good and because several of the determinations are averages based on multiple observations at a given location. Note that these determinations tend to exceed the declinations calculated from model Bgs1800 (see below).

In comparing the declinations in Table 1, it is useful to note that the various calculations do not have the same probable errors. Magnetic declinations based on Polaris may be easiest to understand, but the required compass measurement may be the most inaccurate of all because of Polaris' high altitude, particularly at high latitude (e.g., Montana). Moreover, the compass was necessarily read at night and probably by candle! Magnetic declinations based on the Sun's position and the clock time may be the next most appealing, as they are based entirely on measurements made by Lewis and Clark, but their chronometer was commonly inaccurate by as much as several minutes each day. A clock error of only four minutes relative to the interpolated time of noon translates into an error of an entire degree in the hour angle! As a result, the most reliable determinations of magnetic declination are based on the probable latitude of Lewis and Clark at the time of their measurement (eq. 3), which can generally be determined on modern maps to $\pm 0.02^\circ$ or better. Since their sextant was accurate to a few minutes of arc, and the ephemeris tables are extremely accurate, then the

¹GSA Data Repository Item 2003154, Table 2, Determinations of Magnetic Declination in 1803–1806 and 2003 is available on request from Documents Secretary, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA, editing@geosociety.org, or at www.geosociety.org/pubs/ft2003.htm.

greatest error in the calculated magnetic declination by this method arises from Lewis and Clark's compass reading of the Sun's position.

Kaskaskia Island, Illinois

It is useful to illustrate the combined use of Lewis and Clark's journals and measurements, the calculated declination, and modern maps in a case where a profound change in the course of a major river has occurred. Lewis and Clark kept detailed records of each travel leg on their journey, continuously recording both the compass bearing and the estimated, "dead reckoned" distance to the nearest quarter mile. This record begins at the confluence of the Ohio and the Mississippi Rivers, continues almost without interruption to the Pacific coast, and records in incredible detail their daily travel observations. Comparison of these notes and traverses with modern maps quantifies changes in the landscape and river course.

For example, examination of a modern road map reveals that part of the State of Illinois—notably Kaskaskia Island—lies west of the Mississippi River. The detailed notes of Lewis and Clark can be used to illustrate the historical developments that led to this unusual situation. After traveling generally northwest during the afternoon of 27 November 1803, Lewis and Clark came to and camped on the "lower point of the horse Island," situated at that time at the confluence of the Kaskaskia and Mississippi Rivers (Fig. 3). The following morning the explorers parted company, with Lewis continuing northwest by land to the town of (Old) Kaskaskia, and Clark plus the main party continuing upstream and generally southwest with the boats (Moulton, 1986–1993, v. 2, p. 117–118).

The large dots and the dotted line on Figure 3 mark the travel legs of the boat as recorded by Clark, but corrected for the 1803 declination of about 7.5° (Table 1). Clark's course was along a modern-day slough called the Old River that still marks the boundary between the states of Illinois and Missouri. At 1 p.m. they passed Donohoes Landing (Fig. 3), where "boats receive Salt from the Saline Licks" that were located 2.5 miles up Saline Creek (Moulton, 1986–1993, v. 2, p. 118). They then continued

more northerly, but the plotted positions suggest that Clark's estimated distances for these travel legs are a little too large.

Lewis traveled up the historical valley of the Kaskaskia River to the old town of Kaskaskia (founded in 1703), which was already a century old at that time and had been captured by Clark's older brother, General George Rogers Clark, during the American Revolution. Old Kaskaskia was destined to become the first state capital of Illinois. However, the fate of the old town changed during the great flood of 1881, when the Mississippi River underwent a disastrous shift to occupy the course of the lower Kaskaskia River (e.g., Franzwa, 1998). The latter channel was much too small to accommodate the huge Mississippi River, and the consequent erosion and widening ultimately destroyed the old town, requiring its abandonment and relocation to the center of Kaskaskia Island. Kaskaskia Island has since remained part of Illinois despite several court challenges.

Big Bend, South Dakota

A particularly instructive example of Lewis and Clark record keeping and methodology is the Big Bend of Missouri River, which the explorers described and mapped during 19–22 September 1804. Figure 4 (top) shows a modern map of this part of the river, now inundated beneath Lake Sharpe above Big Bend Dam, on which is superimposed a string of connected dots representing the individual travel legs reported in the journals by compass bearing and estimated distance. The plotted points are indexed to the 19 September campsite at the mouth of Night Creek, now Counselor Creek, with the bearing corrected for a declination of 12.5° (cf. Fig. 2A) but with the exact linear scale retained. A detailed sketch map of the same region, representing part of Clark-Maximilian sheet no. 11 (Moulton, 1983), is shown below, also rotated by 12.5°.

The correspondence between the modern map, the rotated travel legs, and the rotated sketch map testifies to the accuracy of Lewis and Clark's work. This comparison is facilitated because it is very unlikely that the former position of the river in this area lies outside what is now Lake Sharpe. Even though

the error of the plotted points would progressively accumulate beyond the 19 September 1804 campsite, note that the plotted point corresponding to the 22 September campsite, described in the journals as being opposite former Goat Island, is projected to lie within 3 miles of its actual position. Note also that were the sketch map and dots not corrected for declination, that Goat Island would lie west and significantly south of the northernmost point on the Big Bend, rather than to the west and significantly north. Thus, the prominent "north" arrow on the sketch map clearly corresponds to magnetic north in 1804. The illustration also provides an example of the accuracy of Lewis and Clark's sextant. Note in the lower left of the sketch map their latitude determination of 44°11'33", which compares favorably with the actual latitude of 44°7'30"; the corresponding positional difference is only about 4 miles. The journals contain several pages of descriptive material for this area, much of which is indexed to the individual travel legs and sketch map. The Big Bend is described in the journals as being more than 30 miles around but only 2000 yards overland across its neck, and as encompassing "a butifull inclined Plain in which there is great numbers of Buffalow, Elk & Goats (pronghorn) in view feeding & Scipping on those Plains...." (Moulton, 1986–1993, v. 3, p. 98).

Cape Disappointment, Washington

A detailed comparison of declinations based on Lewis and Clark's measurements, those made by early observers at sea, and those calculated from magnetic models can be made at Cape Disappointment near the mouth of the Columbia River (Fig. 5). This is the only site where Lewis and Clark were positioned near the coast and so provides the only direct link between their measurements and the large body of oceanic data. Captain George Vancouver made the first declination measurements in this area in 1792, and several measurements were subsequently made when this important area was visited by other ships as compiled by Schott (1856). The declination of 19.4° based on equation 3 and Lewis and Clark's observations of 24 November 1805 (Table 2) agrees very well with the other early measurements,

and also with the equation suggested by Schott (1856; dotted line) to describe the variation of declination in this area (Fig. 5). Note that all of the measured declinations are higher than those calculated from the British Geological Survey models for this 60-year interval; the average discrepancy is nearly 1.5°.

CONCLUSIONS

Observations made by Lewis and Clark can be used to calculate the magnetic declination in the continental interior of the United States in 1803–1806. The reduced data provide the oldest determinations of magnetic declination in the continental interior and are essential to interpreting the travel legs and the thousands of compass bearings reported by Lewis and Clark along their historic journey. The calculations confirm the westward drift of the agonic line and indicate that the temporal changes in declination have been greatest in the mid-continent and smallest along the northwest coast. The declinations based on Lewis and Clark's data are more accurate than those typical of the period and provide a test of the accuracy of magnetic models for this time interval.

ACKNOWLEDGMENTS

Dan Nunes provided valuable discussions about spherical trigonometry and suggested Figure 1. I also thank Bill Winston for help with ARCview, Duane Champion for discussion and for providing the Schott (1856) reference, and Clara McLeod and Bethany Ehlmann for help securing historical ephemeris data.

REFERENCES CITED

Becker, G.F., 1882, Geology of the Comstock lode and Washoe district: U.S. Geological Survey Monograph, v. 3, 422 p., with Folio Atlas of 21 sheets.
 Bloxham, J., 1995, Global magnetic field, in Ahrens, T.J., ed., Global earth physics: A handbook of physical constants: Washington, D.C., American Geophysical Union, AGU Reference Shelf 1, p. 47–65.

Bowditch, N., 1939, American Practical Navigator: Washington, D.C., United States Hydrographic Office, U.S. Government Printing Office.

Franzwa, G.M., 1998, The story of Old Ste. Genevieve: Tucson, The Patrice Press, 211 p.

Garnet, J., 1804, The nautical almanac and astronomical ephemeris for the year 1804: New Brunswick, New Jersey, Second American Impression, (microform) Early American imprints, Second series, no. 50378.

Garnet, J., 1805a, The nautical almanac and astronomical ephemeris for the year 1805: New Brunswick, New Jersey, Second American Impression, (microform) Early American imprints, Second series, no. 6854.

Garnet, J., 1805b, The Nautical Almanac and Astronomical Ephemeris for the Year 1806: New Brunswick, New Jersey, Second American Impression, (microform) Early American imprints, Second series, no. 8960.

Harlan, J.D., 2003. <http://lewisclark.geog.missouri.edu/campsites/1804/camps.shtml> (July 2003).

Hoover, H.C. and Hoover, L.H., 1950, translators, De Re Metallica: New York, Dover, p. 57.

Jackson, A., Jonkers, A.R.T., and Walker, M.R., 2000, Four centuries of geomagnetic secular variation from historical records: Philosophical Transactions of the Royal Society of London, A 358, p. 957–990.

Malin, S.R.C., and Bullard, E., 1981, The direction of Earth's magnetic field at London, 1570–1975: Philosophical Transactions of the Royal Society of London, A 299, p. 357–423.

Maskelyne, N., 1803, The nautical almanac and astronomical ephemeris for the year 1803: London, Commissioners of Longitude.

Maskelyne, N., 1806, Tables requisite to be used with the nautical ephemeris for finding the latitude & longitude at sea: New Brunswick, New Jersey, [microform] Early American imprints, Second series, no. 10465.

Moulton, G.E., 1983, The Journals of the Lewis and Clark Expedition, vol. 1, Atlas of the Lewis and Clark Expedition: Lincoln, Nebraska, and London, University of Nebraska Press.

Moulton, G.E., 1986–1993, The journals of the Lewis and Clark expedition, vols. 2–9: Lincoln, Nebraska, and London, University of Nebraska Press.

Preston, R.S., 2000, The accuracy of the astronomical observations of Lewis and Clark. Proceedings of the American Philosophical Society, v. 144, no. 2, p. 168–191.

Schott, C.A., 1856, An attempt to determine the secular change of the magnetic declination on the western coast of the United States: Report of the Superintendent of the United States Coast Survey, Appendix 31.

Smart, W.M., 1977, Spherical astronomy: New York, Cambridge University Press.

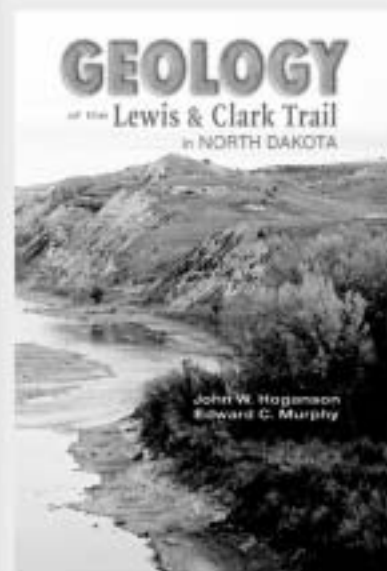
U.S. Naval Observatory, 2003, The astronomical almanac for the year 2003: Washington, D.C.: U.S. Government Printing Office.

U.S. Geological Survey, 2003, Magnetic models: http://geomag.usgs.gov/frames/mag_mod.htm (July 2003).

*Manuscript submitted 4 June 2003; accepted 1 August 2003. **

GEOLOGY of the LEWIS & CLARK TRAIL in NORTH DAKOTA

by John W. Hoganson and Edward C. Murphy



Armed with geologic and paleontologic knowledge that Lewis and Clark did not have on their historic journey, John Hoganson and Ed Murphy follow the explorers' path through western North Dakota, leading you on a geologic tour of the Missouri River valley. With nontechnical prose and full-color maps and photographs, the authors explain and point out the geologic wonders that Lewis and Clark recorded in their journals—burning coal veins, petrified trees, cannonball concretions—as well as more modern discoveries such as dinosaur fossils and a network of now-abandoned channels that carried meltwater from continental glaciers.

6x9 • 264 pages • Item #GSA294
 15 maps • 140 color photographs
 paper \$18 • ISBN 0-87842-476-8
 Please include \$3.00 for s/h per order.

MOUNTAIN PRESS PUBLISHING COMPANY

P.O. Box 2399 • Missoula, MT 59806

PHONE 406-728-1900

FAX 406-728-1635

E-MAIL info@mtnpublish.com

WEBSITE www.mountain-press.com

TOLL FREE 1-800-234-5308



ASSOCIATION FOR WOMEN GEOSCIENTISTS

To Educate, To Encourage
 To Enhance Professional Growth
 Visit us at Booth #928
 Learn more about AWG and
 meet our members

P.O. BOX 30645 • LINCOLN, NE 68503 • WWW.AWG.ORG

LANCE ARMSTRONG



"EVERYTHING MUST BE

ENGINEERED

TO THE LAST DETAIL."



THE
GEOLOGICAL
SOCIETY
OF AMERICA

The ABC's of Safety: Air bags. Buckle up. Children in backseat.

SUBARU OUTBACK® VDC

The six-cylinder Outback VDC has our most advanced Symmetrical All-Wheel Drive System. Among other components, it uses sophisticated sensors to help prevent loss of control before the driver realizes there's trouble. In other words, it's built to worry about the details for you.

Professional.subaru.com

SUBARU 

DRIVEN BY WHAT'S INSIDE™

Geoscience Horizons: Seattle 2003

GSA Annual Meeting & Exposition
Washington State Convention & Trade Center



November 2-5, 2003

ANNUAL MEETING SPONSOR



Title Sponsor of the 2003 GSA Annual Meeting

ANNUAL MEETING HOST

University of Washington

Welcome to Seattle and to the 2003 Annual Meeting of the Geological Society of America. This meeting generated the largest number of abstracts in GSA history, and so any list of "program highlights" here would be completely inadequate. We would, however, like to take this opportunity to express our great appreciation to the many people involved in making this meeting a great success, particularly the Technical Program Committee and the GSA Headquarters staff, together with the field trip leaders, session organizers, short course presenters, and student volunteers. Take a moment to thank those you meet—the commitment from everyone involved has been terrific!

—Seattle Local Committee

SEATTLE LOCAL COMMITTEE

Derek B. Booth
General Chair

Elizabeth Nesbitt
K-16 Education Chair

Terry W. Swanson
Field Trip Chair

Frederick L. Schwab
Hot Topics Chair

Dave Bush
Technical Program Chair

Speaker Ready Room

GSA will have the Speaker Ready Room open longer this year to accommodate all speakers submitting their PowerPoint presentations. GSA provides a networked computer system to allow a smoother transition for those making oral presentations. All presentations will be downloaded to a main file server and then uploaded to the specific computer in the technical session room where the speaker will be making his or her presentation. Each speaker making PowerPoint or 35mm slide presentations will advance his or her own presentation from the podium. Speakers may submit their PowerPoint presentations on any format (CD-ROM, floppy disk, Zip disk, Thumb Drive, Compact Flash Card, SD Card, Multi-Media Card, and Memory Stick). All PowerPoint presentations **MUST** be submitted to AVHQ (GSA's official audiovisual services contractor), either in advance of the meeting via AVHQ's Web site **OR** onsite in the Speaker Ready Room. If you are a Sunday session speaker and are unable to get to the Speaker Ready Room the day or evening before giving your presentation, please visit it first thing Sunday morning.



Hours of Operation Extended!

SPEAKER READY ROOM

**Washington State Convention & Trade Center
Room 309/310**

Fri., Oct. 31 ❖ 1–6 p.m.
Sat., Nov. 1 ❖ 7 a.m.–8 p.m.
Sun., Nov. 2 ❖ 6 a.m.–6 p.m.
Mon.–Wed., Nov. 3–5 ❖ 6:30 a.m.–6 p.m.

**For presentation submission prior to the meeting,
please upload to the AVHQ
Web site: www.avhqspeakerservices.com.**

GSA Annual Meeting Program

Geoscience Horizons: Seattle 2003

263 Technical Sessions

All sessions will be held at the Washington State Convention & Trade Center and are oral unless indicated as poster sessions. Check the GSA Web site—www.geosociety.org—for updates, detailed listings, abstracts, and the titles and authors database.

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
SATURDAY, NOVEMBER 1			
1	8 a.m.	T14. Modern and Ancient Mineralizing Seafloor Hydrothermal Systems I (<i>Society of Economic Geologists</i>)	615/616/617
2	1:30 p.m.	T14. Modern and Ancient Mineralizing Seafloor Hydrothermal Systems II (<i>Society of Economic Geologists</i>)	615/616/617
SUNDAY, NOVEMBER 2			
3	8 a.m.	Geophysics/Tectonophysics/Seismology	210
4	8 a.m.	Geoscience Education I: Issues in K–12 Science Education, Religion, and Outreach to the Public	2A
5	8 a.m.	Geoscience Information/Communication (Posters)	Hall 4-F
6	8 a.m.	Geoscience Information/Communication: Challenges in Geoscience Publishing: Perspectives of Communicating Geoscience to Scientists and to the General Public (<i>Association of Earth Science Editors</i>)	204
7	8 a.m.	Planetary Geology (Posters)	Hall 4-F
8	8 a.m.	Quaternary Geology/Geomorphology I: Streams and Slopes	618/619/620
9	8 a.m.	Tectonics (Posters) I: Strike-slip, Extension, Alpine-Himalayan Tectonics	Hall 4-F
10	8 a.m.	Volcanology (Posters)	Hall 4-F

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
11	8 a.m.	P2. His View of Life: Reflections on the Scientific Legacy of Stephen J. Gould (<i>Paleontological Society</i>)	Ballroom 6B
12	8 a.m.	T1. The Peopling of the New World: Geology, Archaeology, and Paleoenvironments (<i>GSA Archaeological Geology Division; GSA Quaternary Geology and Geomorphology Division; Society for American Archaeology</i>)	Ballroom 6A
13	8 a.m.	T4. Mathematical Modeling of Earth Surface Processes: The Good, the Bad, and the Ugly	4C-3
14	8 a.m.	T7. Geologists in the U.S. Peace Corps: The Contribution of Peace Corps Geologists to International Development and the Contribution of the Peace Corps Experience to the Development of the Geosciences in America (<i>GSA International Division; Association of Geoscientists for International Development; U.S. Peace Corps; Ghana Geological Survey; U.S. Geological Survey</i>)	400
15	8 a.m.	T15. Characterizing Complexity in Geomechanics, Engineering Geology, and Hydrogeology (<i>GSA Engineering Geology Division</i>)	3B
16	8 a.m.	T29. In Our Own Backyards: Undergraduate Research in a Local Context (Posters) (<i>Council on Undergraduate Research, Geosciences Division</i>)	Hall 4-F
17	8 a.m.	T54. Geochemical Modeling of Arsenic Speciation, Transformation, and Reactive Transport in Groundwater (<i>GSA Hydrogeology Division</i>)	609
18	8 a.m.	T62. Flow and Biogeochemical Processes at the Interface Between Surface Water and Groundwater (<i>GSA Hydrogeology Division</i>)	608
19	8 a.m.	T66. Karst Hydrology and Geomorphology in North America Over the Past Half Century I: In Honor of Derek Ford and William White (<i>GSA Hydrogeology Division; GSA Quaternary Geology and Geomorphology Division; Karst Waters Institute</i>)	607
20	8 a.m.	T70. Heterogeneity in Sedimentary Aquifers: Challenges for Characterization and Flow Modeling (<i>GSA Hydrogeology Division</i>)	606
21	8 a.m.	T86. Fossil Decapod Crustacean Paleobiogeography, Systematics, and Evolution Over the Past 20 Years: In Honor of Ross and Marion Berglund (Posters) (<i>Paleontological Society</i>)	Hall 4-F
22	8 a.m.	T90. Terrestrial Paleobiology of South America, Cretaceous through Neogene (<i>Paleontological Society</i>)	4C-4
23	8 a.m.	T96. Lakes and Holocene Environmental Change: The Use of Multiproxy Lake Records for Paleoclimate Reconstructions I (<i>GSA Limnogeology Division</i>)	307/308
24	8 a.m.	T101. Erosion, Exhumation, and Uplift: Complex Interactions and Feedback Mechanisms Between Tectonics and Geomorphology (Posters) (<i>GSA Quaternary Geology and Geomorphology Division; GSA Structural Geology and Tectonics Division</i>)	Hall 4-F
25	8 a.m.	T102. Geological Mapping: Key to Successful Management of Water and Land Resources (Posters) (<i>GSA Quaternary Geology and Geomorphology Division; GSA Hydrogeology Division; GSA Engineering Geology Division; U.S. Geological Survey; Association of American State Geologists</i>)	Hall 4-F
26	8 a.m.	T103. Comprehensive Landscape Analysis—A Predictive Tool for Mapping Surficial Deposits and Their Environmental Attributes (<i>GSA Sedimentary Geology Division</i>)	602/603/604
27	8 a.m.	T106. Quaternary History and Stratigraphy of the Pacific Northwest (Posters) (<i>GSA Sedimentary Geology Division</i>)	Hall 4-F

THE POKESCOPE™ FOLDING 3D VIEWER
for viewing stereo images of all sizes
COMPACT FOLDS TO 2" SQ. **EASY TO USE**
FOR: DIGITAL STEREO IMAGES • UNMOUNTED STEREO PRINTS
USGS AERIAL PHOTOGRAPHS • FIELD USE



\$49.95 SHIPPING
INCLUDES Pokescope™ Image Manager SOFTWARE

Graphic Media Research
211 Ridgecrest Dr.
Cannon Falls, MN 55009 USA
507-263-4611

www.pokescope.com



Rite in the Rain
ALL-WEATHER WRITING PAPER

The Perfect Field Books
order now for next term

"...On one of our trips, one of the students dropped her "Rite in the Rain" notebook in a stream. After several minutes, it was retrieved. Expecting the worst, she opened it to find the water rolling off the dry pages. Thanks!"
Dr. Barbara Manner
DePaul University

(253) 922-5000 www.RiteintheRain.com/gsa.html

The Theory of Plate Tectonics

Winner of the 2003 EDDIE Award for Science, *ComputEd Gazette Review 2003* says about the program, "...this is an important scientific theory...addressed by this extremely well-done title in a thorough, level-headed and fascinating way."

Version 2.0.1
Interactive CD-ROM

Written by Ed Tarbuck and Fred Lutgens

This fully updated version is a dynamic exploration of how Earth's lithospheric plates change through time. A rigorous and thorough study of a complex topic, the program is fully narrated and features excellent graphics and animations that will captivate the interest of educators and pupils alike. This effective tool can be used by students for self-directed study and in classroom presentations by instructors.

The CD-ROM also features easy navigation, an illustrated glossary, an index that links to key frames, and scored review activities. Two levels, Intermediate and Advanced, are included.

Detailed information about *The Theory of Plate Tectonics* and how to order it can be found at our website: www.TasaGraphicArts.com, or by calling (800) 293-2725.



Tasa
Graphic Arts, Inc.

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
28	8 a.m.	T119. Revisiting the Biogeochemistry of Black Shales and Oxygen-Deficient Marine Environments (<i>Geochemical Society; GSA Sedimentary Geology Division; SEPM—Society for Sedimentary Geology</i>)	3A
29	8 a.m.	T124. The Geologic Record of Biosphere Dynamics—The Key to Understanding the Biotic Effects of Future Environmental Change (<i>GSA Geobiology and Geomicrobiology Division</i>)	2B
30	8 a.m.	T128. Barremian to Turonian Carbonate Platform Facies in Northeastern Mexico, their Paleogeographic, Paleooceanic, and Paleoclimatic Implications: Comparison with Coeval Facies Elsewhere in the Tethys (Posters) (<i>GSA Sedimentary Geology Division; SEPM—Society for Sedimentary Geology</i>)	Hall 4-F
31	8 a.m.	T129. The Jurassic System of North America: Stratigraphy, Tectonics, and Depositional History (Posters) (<i>GSA Structural Geology and Tectonics Division; GSA Sedimentary Geology Division; SEPM—Society for Sedimentary Geology</i>)	Hall 4-F
32	8 a.m.	T132. Understanding Coupled Metamorphic and Deformational Processes: Advances in Integrated Textural, Chemical, and Microstructural Analysis (<i>GSA Structural Geology and Tectonics Division; Mineralogical Society of America</i>)	611/612
33	8 a.m.	T139. Granites at Convergent Margins: Physical and Chemical Constraints on Processes and Petrogenesis (<i>Mineralogical Society of America</i>)	615/616/617
34	8 a.m.	T141. Phase Relations, High <i>P-T</i> Terrains, <i>P-T</i> -ometry and Plate Pushing I: A Tribute to W.G. Ernst (<i>Mineralogical Society of America</i>)	Ballroom 6C
35	8 a.m.	T143. Earthquake Geology in Reverse-Faulting Terrains (<i>GSA Quaternary Geology and Geomorphology Division</i>)	613/614
36	1 p.m.	Archaeological Geology I	2A
37	1 p.m.	Economic Geology I: PGE and Magmatic Deposits	210
38	1 p.m.	Geochemistry, Aqueous I: Low Temperature Processes and Mechanisms	307/308
39	1 p.m.	Limnogeology: Carbon in Lake Systems	204
40	1 p.m.	Paleontology/Paleobotany VIII: Early Life	4C-3
41	1 p.m.	Public Policy	2B
42	1 p.m.	Quaternary Geology/Geomorphology II: Late Cenozoic Glacial Chronologies	618/619/620
43	1 p.m.	Sediments, Clastic I	3B
44	1 p.m.	Structural Geology I: Advances in Rock Mechanics	609
45	1 p.m.	Tectonics I: Cordilleran Terranes, Arc Tectonics	615/616/617
46	1 p.m.	T32. Using Data to Teach Earth Processes: An Illustrated Community Discussion (Posters). Special Session in Support of the NAGT/DLESE “On the Cutting Edge” Program (<i>National Association of Geoscience Teachers</i>)	Hall 4-F
47	1 p.m.	T56. Recent Advances in Outcrop-Aquifer Analog Studies: Insights from Geophysical, Geostatistical, and Modeling Techniques (<i>GSA Hydrogeology Division</i>)	607
48	1 p.m.	T67. Hydrogeologic Analysis of Glaciated Terrains (<i>GSA Hydrogeology Division; GSA Engineering Geology Division</i>)	608
49	1 p.m.	T80. The Impact of Crystal Chemistry in the Earth Sciences I: A Tribute to Charles T. Prewitt, Recipient of the 2003 Roebling Medal of the Mineralogical Society of America (<i>Mineralogical Society of America</i>)	Ballroom 6A
50	1 p.m.	T94. Bridging the Gap: Ostracodes in the Earth Sciences (<i>Paleontological Society; GSA Limnogeology Division</i>)	4C-4
51	1 p.m.	T99. Soils and a Sustainable Future—The Neglected Challenge in Geology: A Tribute to the Many Contributions and Challenges of Aldo Leopold (<i>GSA Geology and Public Policy Committee; U.S. National Committee for the Geological Sciences; Geological Association of Canada; Canadian Society of Soil Science; GSA Sedimentary Geology Division</i>)	400
52	1 p.m.	T113. Glaciers, Glacial Geology, and Glacial Ecosystems in the National Parks (<i>National Park Service</i>)	611/612
53	1 p.m.	T116. Sabkha Environments, Recent Insights (<i>GSA Hydrogeology Division; GSA Sedimentary Geology Division; SEPM—Society for Sedimentary Geology</i>)	602/603/604

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
54	1 p.m.	T134. The Columbia River Flood Basalts: New Insights into the Volcanism, Petrology, and Tectonism of a Large Igneous Province: Dedicated to Peter Hooper on His Retirement (<i>Mineralogical Society of America; GSA Structural Geology and Tectonics Division</i>)	606
55	1 p.m.	T141. Phase Relations, High <i>P-T</i> Terrains, <i>P-T</i> -ometry and Plate Pushing II: A Tribute to W.G. Ernst (<i>Mineralogical Society of America</i>)	Ballroom 6C
56	1 p.m.	T144. Tectonics of the Circum-Pacific Rim in Space and Time: Focus on Alaska, Central and South America, and the Western Pacific (<i>GSA International Division; U.S. National Committee on the Geological Sciences; Circum-Pacific Council; GSA Structural Geology and Tectonics Division</i>)	613/614

MONDAY, NOVEMBER 3

57	8 a.m.	Coal Geology (Posters)	Hall 4-F
58	8 a.m.	Engineering Geology (Posters)	Hall 4-F
59	8 a.m.	Environmental Geoscience (Posters) I	Hall 4-F
60	8 a.m.	Geochemistry, Other I: From Hydrothermal Fluids to Hot Rocks	204
61	8 a.m.	Geomicrobiology: Microbes, Minerals, and the Natural Environment II (Posters)	Hall 4-F
62	8 a.m.	Geophysics/Tectonophysics/Seismology (Posters)	Hall 4-F
63	8 a.m.	Geoscience Education (Posters) I	Hall 4-F
64	8 a.m.	Hydrogeology I: Hydrology and Water Resources	613/614
65	8 a.m.	Paleontology/Paleobotany (Posters) I	Hall 4-F
66	8 a.m.	Paleontology/Paleobotany I: Phylogeny and Evolutionary Patterns	400
67	8 a.m.	Planetary Geology/Remote Sensing/Geographic Information System	210
68	8 a.m.	Quaternary Geology/Geomorphology (Posters) I: Lakes, Dunes, Soils, and Tectonics	Hall 4-F
69	8 a.m.	Sediments, Clastic (Posters) I	Hall 4-F
70	8 a.m.	Stratigraphy	2A
71	8 a.m.	Structural Geology (Posters) I: Deformation Processes	Hall 4-F
72	8 a.m.	Volcanology and Igneous Petrology	3A
73	8 a.m.	P6. The Paleoenvironmental and Paleoclimatic Framework of Human Evolution (<i>GSA Archaeological Geology Division; GSA Quaternary Geology and Geomorphology Division; GSA Sedimentary Geology Division; SEPM—Society for Sedimentary Geology</i>)	Ballroom 6B
74	8 a.m.	T5. Terroir, Geology, and Wine: A Tribute to Simon J. Haynes (<i>Society of Economic Geologists</i>)	307/308
75	8 a.m.	T44. Sigma Gamma Epsilon Student Research (Posters) (<i>Sigma Gamma Epsilon</i>)	Hall 4-F
76	8 a.m.	T48. Geoscience Information Horizons: Challenges, Choices, and Decisions (<i>Geoscience Information Society</i>)	3B
77	8 a.m.	T51. M. King Hubbert at 100: The Enduring Contributions of Twentieth-Century Geology's Renaissance Man (<i>GSA Hydrogeology Division; National Ground Water Association; U.S. National Chapter of the International Association of Hydrogeologists; GSA Geophysics Division; GSA Sedimentary Geology Division; GSA Structural Geology and Tectonics Division; GSA History of Geology Division</i>)	602/603/604
78	8 a.m.	T55. Groundwater and Watershed Analysis Across Political Boundaries (<i>GSA Hydrogeology Division</i>)	609
79	8 a.m.	T61. Springs: Interactions of Physical, Chemical, Biological, and Cultural Systems (<i>GSA Hydrogeology Division</i>)	606
80	8 a.m.	T65. Evolution and Migration of Brines in Sedimentary Basins (<i>GSA Hydrogeology Division; Society of Economic Geologists; GSA Sedimentary Geology Division; SEPM—Society for Sedimentary Geology</i>)	608
81	8 a.m.	T82. Ocean Chemistry Through the Mesozoic and Cenozoic (<i>Geochemical Society</i>)	618/619/620
82	8 a.m.	T85. Signs of Life: the Role of Paleobiology in the History of Evolutionary Theory and our Attempts to Understand the Changing Nature of the Biosphere (<i>GSA History of Geology Division; Paleontological Society; Society of Vertebrate Paleontology; Cushman Foundation; History of Earth Science Society [HESS]</i>)	4C-4

NEW EDITION!

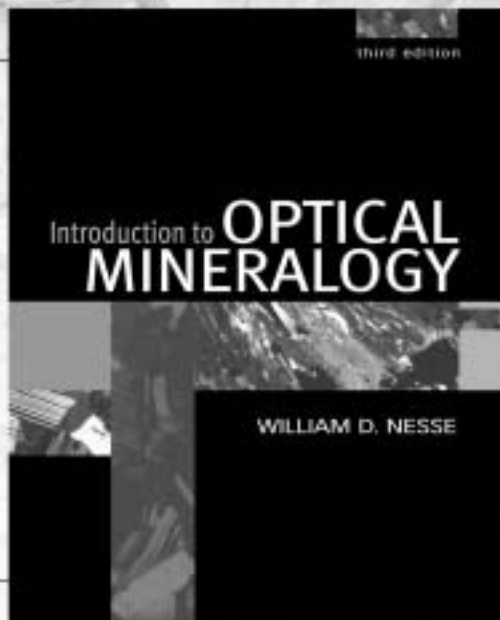
INTRODUCTION TO OPTICAL MINERALOGY

Third Edition

William D. Nesse

The third edition of *Introduction to Optical Mineralogy* provides comprehensive coverage of the optical properties of minerals. It describes in detail more than 125 common rock-forming minerals and a selection of common ore minerals. Revised chapters on optical theory discuss the petrographic microscope, the nature and properties of light, the behavior of light in isotropic and anisotropic materials, and uniaxial and biaxial anisotropic optics. Ideal for advanced undergraduate and graduate courses in optical mineralogy, this accessible text is also an essential resource for petrology/petrography courses.

2003 368 pp., 382 illus. cloth



NEW!



AN ATLAS OF MINERALS IN THIN SECTION

CD-ROM

Daniel J. Schulze

This CD contains color images of 65 minerals in thin section, pictures of common alteration products—all indexed by mineral structure and composition—and more than 200 illustrations of important optical properties used in thin section identification.

2003 CD-ROM

FORTHCOMING!



VOLCANOES

Second Edition

Peter Francis and Clive Oppenheimer

The second edition of *Volcanoes* discusses the impact of volcanic eruptions on the Earth's environment—a cause of debate and extensive research by leading academics worldwide. The text features excellent illustrations and includes a new chapter on volcanic

hazards, which looks at complex scientific and sociological issues surrounding risk mitigation.

December 2003 480 pp., 570 illus. paper

ALSO AVAILABLE

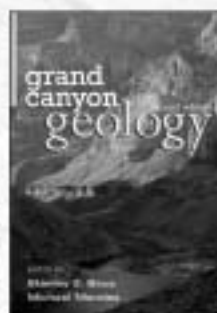
GRAND CANYON GEOLOGY

Second Edition

Edited by Stanley S. Beus and Michael Morales

This second edition of the leading book on Grand Canyon geology contains the most recent discoveries and interpretations of the origin and history of the canyon. It includes two entirely new chapters: one on debris flow in the Canyon and one on the impact of water flow releases from the Glen Canyon Dam. All chapters have been updated where necessary and all photographs have been replaced or re-screened for better resolution.

2001 448 pp., 227 illus. & maps cloth



To order or for more information, call 1-800-451-7556. In Canada, call 1-800-387-8020. Visit our web site at www.oup-usa.org/highered

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
83	8 a.m.	T91. Understanding Late Devonian Biotic, Climatic, and Oceanographic Events: Toward an Integrated Approach I (<i>Paleontological Society</i>)	4C-3
84	8 a.m.	T96. Lakes and Holocene Environmental Change: The Use of Multiproxy Lake Records for Paleoclimate Reconstructions (Posters) (<i>GSA Limnogeology Division</i>)	Hall 4-F
85	8 a.m.	T105. Ecological Implications of Headwater Channel Processes	611/612
86	8 a.m.	T106. Quaternary History and Stratigraphy of the Pacific Northwest (<i>GSA Sedimentary Geology Division</i>)	607
87	8 a.m.	T123. Advances in Stratigraphic Analyses Using Ground Penetrating Radar (<i>GSA Geophysics Division; GSA Engineering Geology Division; GSA Sedimentary Geology Division</i>)	615/616/617
88	8 a.m.	T137. Submarine Hydrothermal Systems: The Emergence of Geobiology	2B
89	8 a.m.	T140. Modeling Metamorphism: Petrology, Geochemistry, and Tectonics I (<i>Mineralogical Society of America; Geochemical Society; GSA Structural Geology and Tectonics Division</i>)	Ballroom 6A
90	8 a.m.	T141. Phase Relations, High P-T Terrains, P-T-ometry and Plate Pushing III: A Tribute to W.G. Ernst (<i>Mineralogical Society of America</i>)	Ballroom 6C
91	1:30 p.m.	Archaeological Geology II	2A
92	3:30 p.m.	Coal Geology	210
93	1:30 p.m.	Economic Geology (Posters) I: PGE, Magmatic, and Porphyry Deposits	Hall 4-F
94	1:30 p.m.	Economic Geology (Posters) II: Miscellaneous Ore Deposits and Genesis	Hall 4-F
95	1:30 p.m.	Environmental Geoscience (Posters) II	Hall 4-F
96	1:30 p.m.	Geochemistry, Aqueous (Posters)	Hall 4-F
97	1:30 p.m.	Geochemistry, Organic (Posters)	Hall 4-F
98	1:30 p.m.	Geochemistry, Other (Posters)	Hall 4-F
99	1:30 p.m.	Geomicrobiology: Microbes, Minerals, and the Natural Environment I	3A
100	1:30 p.m.	Geoscience Education (Posters) II	Hall 4-F
101	1:30 p.m.	History of Geology (<i>GSA History of Geology Division; History of Earth Science Society [HESS]</i>)	210
102	1:30 p.m.	Hydrogeology II: Physical Hydrogeology	602/603/604
103	1:30 p.m.	Paleoclimatology/Paleoceanography (Posters) I	Hall 4-F
104	1:30 p.m.	Quaternary Geology/Geomorphology III: Soils, Aeolian, and Marine Geomorphology	618/619/620
105	1:30 p.m.	Remote Sensing/Geographic Information System (Posters)	Hall 4-F
106	1:30 p.m.	P3. Modeling Metamorphism: Petrology, Geochemistry, and Tectonics (<i>Mineralogical Society of America; Geochemical Society; GSA Structural Geology and Tectonics Division</i>)	Ballroom 6B
107	1:30 p.m.	T11. Expanding Extraterrestrial Geoscience Horizons: Planetary Remote Sensing (<i>GSA Planetary Geology Division</i>)	2B
108	1:30 p.m.	T13. Cathodoluminescence of Quartz in Hydrothermal Ore Deposits (<i>Society of Economic Geologists</i>)	4C-4
109	1:30 p.m.	T19. Biogeochemical and Physical Processes in Mine Pit Lakes (<i>GSA Limnogeology Division</i>)	3B
110	1:30 p.m.	T23. Ecological Stoichiometry: Elemental Cycling and Biogeochemical Interactions in Ecosystem Processes (<i>GSA Geobiology and Geomicrobiology Division; U.S. Geological Survey</i>)	400
111	1:30 p.m.	T27. Cutting Edge and "Vintage" Geochemistry: Celebrating the Science and Life of Glenn Goodfriend (<i>GSA Quaternary Geology and Geomorphology Division; GSA Archaeological Geology Division; Geochemical Society; Paleontological Society</i>)	606
112	1:30 p.m.	T37. Teaching Local Geology: An NAGT Session In Honor of Robert Christman (Posters) (<i>National Association of Geoscience Teachers</i>)	Hall 4-F
113	1:30 p.m.	T49. The National Geologic Map Database (Posters) (<i>U.S. Geological Survey; Association of American State Geologists</i>)	Hall 4-F
114	1:30 p.m.	T66. Karst Hydrology and Geomorphology in North America Over the Past Half Century II: In Honor of Derek Ford and William White (<i>GSA Hydrogeology Division; GSA Quaternary Geology and Geomorphology Division; Karst Waters Institute</i>)	607

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
115	1:30 p.m.	T75. Human Versus Natural Influences on Holocene Sedimentation in Estuaries, Harbors, and Marginal Marine Ecosystems (Posters) (<i>SEPM—Society for Sedimentary Geology; GSA Sedimentary Geology Division</i>)	Hall 4-F
116	1:30 p.m.	T77. Coastal Processes and Hazards Along Active Margin and Low Latitude Coasts (<i>GSA Engineering Geology Division</i>)	4C-3
117	1:30 p.m.	T79. Biogeochemical Processes at Ancient and Modern Methane Seeps I (<i>Burke Museum of Natural History and Culture</i>)	204
118	1:30 p.m.	T81. Multi-Proxy Terrestrial Records and the Ocean-Climate System: Links and Perturbations in the Cretaceous (<i>GSA Sedimentary Geology Division</i>)	609
119	1:30 p.m.	T84. Pliocene Climates—Sea Levels and Ice Volumes (Posters)	Hall 4-F
120	1:30 p.m.	T96. Lakes and Holocene Environmental Change: The Use of Multiproxy Lake Records for Paleoclimate Reconstructions II (<i>GSA Limnogeology Division</i>)	307/308
121	1:30 p.m.	T101. Erosion, Exhumation, and Uplift: Complex Interactions and Feedback Mechanisms Between Tectonics and Geomorphology (<i>GSA Quaternary Geology and Geomorphology Division; GSA Structural Geology and Tectonics Division</i>)	611/612
122	1:30 p.m.	T109. New Insights into the Origins of Glacial Landscapes	613/614
123	1:30 p.m.	T123. Advances in Stratigraphic Analyses Using Ground Penetrating Radar (Posters) (<i>GSA Geophysics Division; GSA Engineering Geology Division; GSA Sedimentary Geology Division</i>)	Hall 4-F
124	1:30 p.m.	T126. Testing Rodinia Using New Maps Compiled for Each Craton through IGCP 440 (<i>GSA Structural Geology and Tectonics Division; International Geologic Correlation Project; Tectonics Special Research Center</i>)	615/616/617
125	1:30 p.m.	T133. Exhumation Along Major Continental Strike-Slip Fault Systems I (<i>GSA Structural Geology and Tectonics Division</i>)	Ballroom 6A
126	1:30 p.m.	T145. The Washington Cascades: An Integrated Perspective on 100 Million Years of Orogenesis, Magmatism, and Surface Processes (<i>GSA Geophysics Division; GSA Structural Geology and Tectonics Division</i>)	608
127	1:30 p.m.	T150. New Views of Seismic Hazard in Cascadia I: Seismology and Seismotectonics I (<i>GSA Geophysics Division</i>)	Ballroom 6C

TUESDAY, NOVEMBER 4

128	8 a.m.	Engineering Geology	618/619/620
129	8 a.m.	Environmental Geoscience I	3A
130	8 a.m.	Hydrogeology (Posters) I: Hydrology	Hall 4-F
131	8 a.m.	Paleontology/Paleobotany II: Morphometrics, Morphological Trends, and Growth	400
132	8 a.m.	Petrology, Igneous (Posters)	Hall 4-F
133	8 a.m.	Petrology, Metamorphic and Experimental (Posters)	Hall 4-F
134	8 a.m.	Quaternary Geology/Geomorphology (Posters) II: Landscape Processes and Histories	Hall 4-F
135	8 a.m.	Stratigraphy (Posters) I	Hall 4-F
136	8 a.m.	Structural Geology (Posters) II: Deformation Processes	Hall 4-F
137	8 a.m.	Tectonics (Posters) II: Rodinia, Gondwana, Pangaea	Hall 4-F
138	8 a.m.	Tectonics II: Transtension and Extension	Ballroom 6C
139	8 a.m.	P1. Global Climate Changes: Abrupt Late Pleistocene Climatic Reversals and Modern Global Warming (<i>GSA Quaternary Geology and Geomorphology Division</i>)	Ballroom 6B
140	8 a.m.	T8. The Role of Geology in the Management of Public and Private Western Temperate Forest Lands (<i>GSA Quaternary Geology and Geomorphology Division; GSA Engineering Geology Division</i>)	615/616/617
141	8 a.m.	T9. The Proposed Deep Geologic Repository for High-Level Radioactive Waste at Yucca Mountain, Nevada: Attributes of the Natural System I (<i>U.S. Department of Energy</i>)	307/308
142	8 a.m.	T12. Advances in Analytical Techniques and New Approaches to the Study of Ore Deposits (<i>Society of Economic Geologists</i>)	607
143	8 a.m.	T33. Beyond Google: Strategies for Developing Information-Literate Geoscience Students (Posters) (<i>National Association of Geoscience Teachers</i>)	Hall 4-F

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
144	8 a.m.	T36. Overcoming Obstacles to Incorporating Experiential Learning into the Undergraduate Geoscience Curriculum	2A
145	8 a.m.	T38. Volunteering in K–12 Settings (<i>GSA Geoscience Education Division; National Association of Geoscience Teachers</i>)	2B
146	10 a.m.	T41. Innovative Approaches to Teaching Sedimentary Geology Courses (<i>GSA Geoscience Education Division; GSA Sedimentary Geology Division; National Association of Geoscience Teachers</i>)	2A
147	8 a.m.	T45. Geological and Geophysical Databases: What We Have and What We Need I (<i>GSA Geophysics Division; GSA Structure and Tectonics Division</i>)	3B
148	8 a.m.	T47. Design and Development of XML-based, Discipline-Specific, Geological Markup Languages, and Development of Applications (with Object-Oriented Languages) and Databases to Process, Store, and Interchange Geological Data over the Web	210
149	8 a.m.	T59. Pharmaceuticals and Emerging Organic Contaminants in the Hydrologic Environment: Progressing from Occurrence to Fate and Effects (<i>GSA Hydrogeology Division; Toxic Substances Hydrology Program; Water Resources Discipline; U.S. Geological Survey</i>)	609
150	8 a.m.	T60. Transport and Remediation of Organic Compounds in the Saturated Zone (<i>GSA Hydrogeology Division</i>)	606
151	8 a.m.	T61. Springs: Interactions of Physical, Chemical, Biological, and Cultural Systems (Posters) (<i>GSA Hydrogeology Division</i>)	Hall 4-F
152	8 a.m.	T62. Flow and Biogeochemical Processes at the Interface Between Surface Water and Groundwater (Posters) (<i>GSA Hydrogeology Division</i>)	Hall 4-F
153	8 a.m.	T63. Exploring the Linkages Between the Geochemistry, Biology, and Hydrology of the Hyporheic Zone (Posters) (<i>GSA Hydrogeology Division</i>)	Hall 4-F
154	8 a.m.	T64. How Subsurface Properties Determine Microbial Habitats: The Role of Groundwater Flow and Subsurface Chemistry in Supplying Energy and Nutrients to the Subsurface Biosphere (<i>GSA Hydrogeology Division; International Association of Hydrogeologists, U.S. National Chapter; GSA Geobiology and Geomicrobiology Division</i>)	602/603/604
155	8 a.m.	T79. Biogeochemical Processes at Ancient and Modern Methane Seeps II (<i>Burke Museum of Natural History and Culture</i>)	204
156	8 a.m.	T88. The Hunt for Precambrian Life: An Integrated Approach (<i>Paleontological Society; GSA Geobiology and Geomicrobiology Division; Precambrian [at large]</i>)	4C-4
157	8 a.m.	T91. Understanding Late Devonian Biotic, Climatic, and Oceanographic Events: Toward an Integrated Approach II (<i>Paleontological Society</i>)	4C-3
158	8 a.m.	T110. Assessing the Deglacial Record of Quaternary Ice Sheets (<i>GSA Quaternary Geology and Geomorphology Division</i>)	613/614
159	8 a.m.	T114. Isotopic Determination of Sediment Provenance: Techniques and Applications (<i>GSA Sedimentary Geology Division; SEPM—Society for Sedimentary Geology</i>)	608
160	8 a.m.	T119. Revisiting the Biogeochemistry of Black Shales and Oxygen-Deficient Marine Environments (Posters) (<i>Geochemical Society; GSA Sedimentary Geology Division; SEPM—Society for Sedimentary Geology</i>)	Hall 4-F
161	8 a.m.	T138. From Oxides to Anorthosites: A Tribute to D.H. Lindsley (<i>Mineralogical Society of America; Geochemical Society</i>)	611/612
162	8 a.m.	T140. Modeling Metamorphism: Petrology, Geochemistry, and Tectonics II (<i>Mineralogical Society of America; Geochemical Society; GSA Structural Geology and Tectonics Division</i>)	Ballroom 6A
163	1:30 p.m.	Archaeological Geology (Posters)	Hall 4-F
164	1:30 p.m.	Economic Geology II: Porphyry, Gold, and Other Deposits	210
165	1:30 p.m.	Environmental Geoscience (Posters) III	Hall 4-F
166	1:30 p.m.	Geochemistry, Other II: A Geochemical Potpourri	204
167	1:30 p.m.	Geoscience Education II: Issues in Undergraduate Education	2B
168	1:30 p.m.	Hydrogeology III: Mass Transport and Hydrogeochemistry	608
169	1:30 p.m.	Paleoclimatology/Paleoceanography (Posters) II	Hall 4-F

NEW AND RECENT TITLES FROM CAMBRIDGE UNIVERSITY PRESS



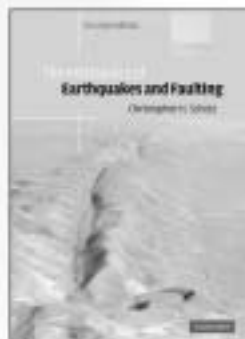
Geochemistry

An Introduction

Francis Albarède

Covers basic principles of geochemical applications to natural waters, deep Earth and planetary processes. Introduces topics rarely covered in a single text and emphasizes processes over descriptive material.

0-521-81468-5 Hardback \$100.00
0-521-89148-5 Paperback \$50.00



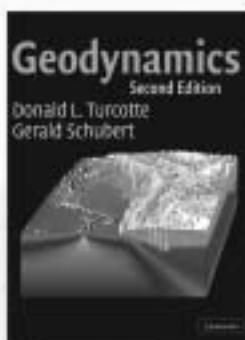
The Mechanics of Earthquakes and Faulting, Second Edition

Christopher H. Scholz

"Scholz has done the rock mechanics community a real service with this fine volume."

—*Geophysics*

0-521-65223-5 Hardback \$130.00
0-521-65540-4 Paperback \$55.00



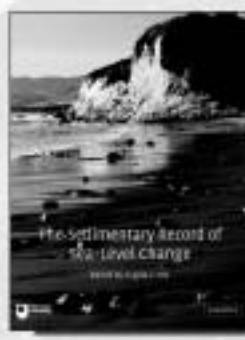
Geodynamics

Second Edition

Donald L. Turcotte and
Gerald Schubert

"The second edition of *Geodynamics*, like its predecessor, stands alone in its ability to link basic theory and geologic observation. *Geodynamics* should continue to benefit new generations of Earth scientists and students for decades to come." —*EOS*

0-521-66186-2 Hardback \$110.00
0-521-66624-4 Paperback \$50.00



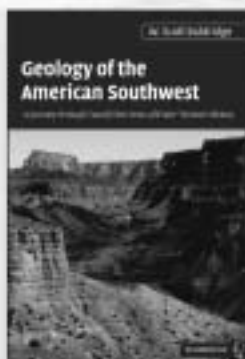
The Sedimentary Record of Sea-Level Change

Edited by Angela L. Coe,
Dan W.J. Bosence, Kevin D. Church,
Stephen S. Flint, John A. Howell, and
R. Chris L. Wilson

"This textbook is simply without equal.... The text is logically laid out and the explanation of sequence-stratigraphic principles is perhaps the most lucid I have read anywhere."

—*Steven Holland, University of Georgia*

0-521-83111-3 Hardback \$110.00
0-521-53842-4 Paperback \$50.00



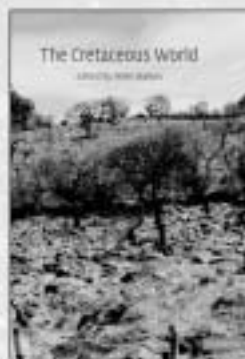
Geology of the American Southwest

A Journey Through Two Billion Years of Plate Tectonic History

W. Scott Baldrige

Presents a concise guide to the geology of the Southwestern U.S. Will prove invaluable to students and will also appeal to anyone interested in the geology and landscape of the region's National Parks.

0-521-81639-4 Hardback \$70.00*
0-521-01666-5 Paperback \$23.00*



The Cretaceous World

Edited by Peter Skelton, Iain Gilmour,
Simon Kelley, and Bob Spicer

Explores the interactions between the physical, chemical and biological processes operating within, and at the surface of, the Earth during this extreme period in history. Supported by a website hosting sample pages, selected illustrations, and exercises.

0-521-83112-1 Hardback \$110.00
0-521-53843-2 Paperback \$50.00

*Prices subject to change.

PLEASE VISIT US AT GSA (BOOTH #202).
EDITOR MATT LLOYD WILL BE AVAILABLE AT THE BOOTH TO DISCUSS IDEAS FOR
BOOK PUBLISHING IN THE EARTH SCIENCES.



CAMBRIDGE
UNIVERSITY PRESS

800-872-7423
us.cambridge.org/earthsciences

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
170	1:30 p.m.	Paleontology/Paleobotany III: Diversity Dynamics, Extinction, and Origination	400
171	1:30 p.m.	Paleontology/Paleobotany IV: Paleocology and Organismal Interactions	4C-3
172	1:30 p.m.	Quaternary Geology/Geomorphology (Posters) III: Glaciers, Volcanoes, Caves, and Isotopes	Hall 4-F
173	1:30 p.m.	Stratigraphy (Posters) II	Hall 4-F
174	1:30 p.m.	Tectonics III: Tectonics of the Circum-Pacific Rim in Space and Time: Focus on Alaska, Central and South America, and the Western Pacific	611/612
175	1:30 p.m.	P5. Preservation of Random Mega-Scale Events on Mars and Earth: Influence on Geologic History (<i>GSA Planetary Geology Division</i>)	Ballroom 6B
176	1:30 p.m.	T8. The Role of Geology in the Management of Public and Private Western Temperate Forest Lands (Posters) (<i>GSA Quaternary Geology and Geomorphology Division; GSA Engineering Geology Division</i>)	Hall 4-F
177	1:30 p.m.	T9. The Proposed Deep Geologic Repository for High-Level Radioactive Waste at Yucca Mountain, Nevada: Attributes of the Natural System II (<i>U.S. Department of Energy</i>)	307/308
178	1:30 p.m.	T24. On the Forefront of Terrestrial and Marine Organic Geochemistry: A Tribute to John I. Hedges (<i>Geochemical Society; American Chemical Society; GSA Geochemical Division</i>)	3A
179	1:30 p.m.	T27. Cutting Edge and "Vintage" Geochemistry: Celebrating the Science and Life of Glenn Goodfriend (Posters) (<i>GSA Quaternary Geology and Geomorphology Division; GSA Archaeological Geology Division; Geochemical Society; Paleontological Society</i>)	Hall 4-F
180	1:30 p.m.	T30. Large Introductory Courses That Work: Sharing Exciting and Effective Teaching Strategies (Posters) (<i>National Association of Geoscience Teachers; GSA Geoscience Education Division</i>)	Hall 4-F
181	1:30 p.m.	T42. Enhancing the Earth Science Content Knowledge of Elementary School Teachers (<i>National Association of Geoscience Teachers</i>)	2A
182	3:30 p.m.	T43. Field and Research Experiences for Students at Two-Year Colleges (<i>National Association of Geoscience Teachers</i>)	2A
183	1:30 p.m.	T45. Geological and Geophysical Databases: What We Have and What We Need II (<i>GSA Geophysics Division; GSA Structure and Tectonics Division</i>)	3B
184	1 p.m.	T50. Henry Darcy's 200th Birthday: Fundamental Advancements Through Observation and Analysis (<i>GSA Hydrogeology Division; National Ground Water Association; GSA History of Geology Division; History of Earth Science Society [HESS]</i>)	602/603/604
185	1:30 p.m.	T58. Saturated and Vadose Zone Hydrogeology, Environmental Geology, and Biogeochemistry of the Department of Energy Hanford Site in Southeastern Washington State (Posters) (<i>GSA Hydrogeology Division</i>)	Hall 4-F
186	1:30 p.m.	T66. Karst Hydrology and Geomorphology in North America Over the Past Half Century (Posters): In Honor of Derek Ford and William White (<i>GSA Hydrogeology Division; GSA Quaternary Geology and Geomorphology Division; Karst Waters Institute</i>)	Hall 4-F
187	1:30 p.m.	T88. The Hunt for Precambrian Life: An Integrated Approach (Posters) (<i>Paleontological Society; GSA Geobiology and Geomicrobiology Division; Precambrian [at large]</i>)	Hall 4-F
188	1:30 p.m.	T89. Evolutionary and Ecological Links Between Terrestrial and Marine Ecosystems in the Phanerozoic (<i>Paleontological Society; GSA Sedimentary Geology Division</i>)	4C-4
189	1:30 p.m.	T104. "Noah's Flood" and the Late Quaternary Geological and Archaeological History of the Black Sea and Adjacent Basins (<i>Avalon Institute of Applied Science</i>)	606
190	1:30 p.m.	T111. McMurdo Dry Valleys, Antarctica, 1903–2003: A Celebration of a Century of Science (<i>GSA Limnogeology Division</i>)	613/614
191	1:30 p.m.	T114. Isotopic Determination of Sediment Provenance: Techniques and Applications (Posters) (<i>GSA Sedimentary Geology Division</i>)	Hall 4-F
192	1:30 p.m.	T118. From the Abyss to the Beach: In Honor of Orrin H. Pilkey	615/616/617
193	1:30 p.m.	T122. Clinoforms: Past, Present, and Modeled (Posters) (<i>GSA Sedimentary Geology Division; SEPM—Society for Sedimentary Geology</i>)	Hall 4-F
194	1:30 p.m.	T127. New Perspectives on Neoproterozoic–Early Paleozoic Development of Western Laurentia: In Honor of John Cooper (<i>GSA Sedimentary Geology Division</i>)	609
195	1:30 p.m.	T133. Exhumation Along Major Continental Strike-Slip Fault Systems II (<i>GSA Structural Geology and Tectonics Division</i>)	Ballroom 6A



Helping researchers & educators
streamline the research process...

Meeting all of your survey needs, SNAP offers fully integrated survey software with on screen Design, Data Collection and Analysis for all types of surveys.

- » Paper based surveys
- » Web & email surveys
- » Scanning surveys
- » PDA surveys
- » Phone surveys
- » Analysis tables, charts and statistics
- » Import/export capabilities to MS Office products
SPSS, and other survey systems

Expanding **SNAP** is easy and simply entails purchasing the additional modules needed. **SNAP** makes importing and exporting to MS Office products, SPSS, and other survey systems easy. **SNAP** is intuitive, fully integrated and very affordable.



Helping
Researchers &
Educators for
over 20 years

For FREE information contact us:
E-mail: usa-info@snapsurveys.com

Phone: 978-463-4093
Web: www.snapsurveys.com

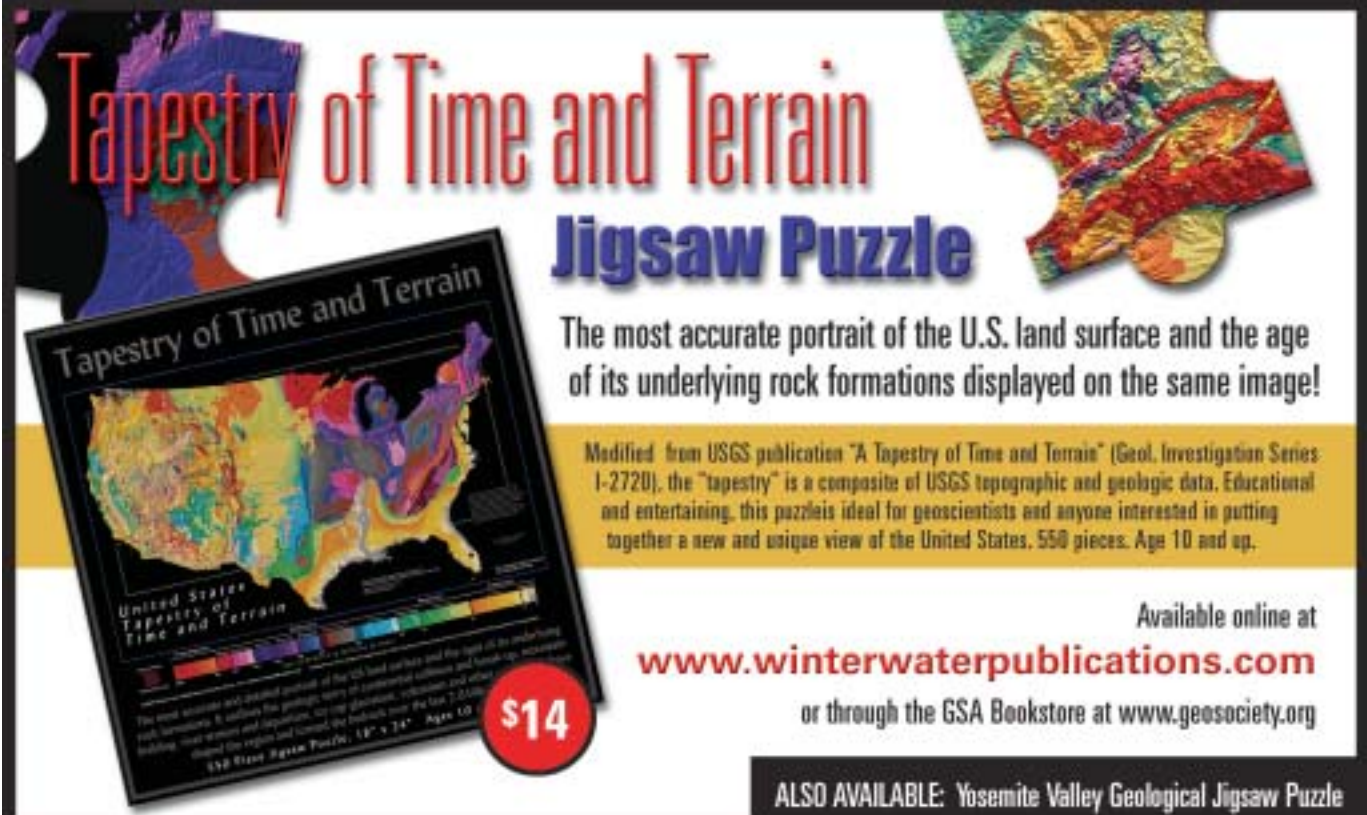
Mercator
Research Group

authors of snap survey software

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
196	1:30 p.m.	T149. Seismic Hazards and Neotectonics in Southern Nevada (Posters) (GSA Geophysics Division)	Hall 4-F
197	1:30 p.m.	T150. New Views of Seismic Hazard in Cascadia I: Seismology and Seismotectonics II (GSA Geophysics Division)	Ballroom 6C
198	1:30 p.m.	T152. Global Climate Changes: Abrupt Late Pleistocene Climatic Reversals and Modern Global Warming (GSA Quaternary Geology and Geomorphology Division)	618/619/620

WEDNESDAY, NOVEMBER 5

199	8 a.m.	Environmental Geoscience II	3B
200	8 a.m.	Geochemistry, Organic: Hydrogen Isotopes and Hydrocarbons	307/308
201	8 a.m.	Hydrogeology IV: Western U.S. Hydrogeology	607
202	8 a.m.	Marine/Coastal Science (Posters)	Hall 4-F
203	8 a.m.	Paleoclimatology/Paleoceanography I	400
204	8 a.m.	Paleontology/Paleobotany (Posters) II	Hall 4-F
205	8 a.m.	Paleontology/Paleobotany V: Biogeography and Paleoenvironmental Reconstruction	4C-3
206	8 a.m.	Precambrian Geology (Posters)	Hall 4-F
207	8 a.m.	Sediments, Carbonates	3A
208	8 a.m.	Sediments, Clastic (Posters) II	Hall 4-F
209	8 a.m.	Tectonics (Posters) III: Cascades, California, Laramide, and Circum-Pacific Tectonics	Hall 4-F
210	8 a.m.	P4. Neoproterozoic Geobiology: Fossils, Clocks, Isotopes, and Rocks (GSA Geobiology and Geomicrobiology Division; NASA Astrobiology Institute; Paleontological Society; Geochemical Society; Precambrian [at large]; GSA Sedimentary Geology Division)	Ballroom 6B
211	8 a.m.	T12. Advances in Analytical Techniques and New Approaches to the Study of Ore Deposits (Posters) (Society of Economic Geologists)	Hall 4-F
212	8 a.m.	T22. Working at the Interface of Isotope Geochemistry and Ecology: A Rapidly Growing Discipline (Posters) (GSA Geobiology and Geomicrobiology Division; U.S. Geological Survey)	Hall 4-F



Tapestry of Time and Terrain

Jigsaw Puzzle

The most accurate portrait of the U.S. land surface and the age of its underlying rock formations displayed on the same image!

Modified from USGS publication "A Tapestry of Time and Terrain" (Geol. Investigation Series I-2720), the "tapestry" is a composite of USGS topographic and geologic data. Educational and entertaining, this puzzle is ideal for geoscientists and anyone interested in putting together a new and unique view of the United States. 550 pieces. Age 10 and up.

Available online at
www.winterwaterpublications.com
or through the GSA Bookstore at www.geosociety.org

ALSO AVAILABLE: Yosemite Valley Geological Jigsaw Puzzle

\$14



GEOBASE

The
Bibliographic
Database
for the Earth,
Geographical
and Ecological
Sciences

GEOBASE is unequalled in its coverage of the international literature. The content crosses subject, language and cultural boundaries, providing a unique research tool to users. The broad areas of coverage can be broken down as follows:

GEOLOGY

Mineralogy, Geochemistry, Sedimentary, Igneous and Metamorphic Geology, Stratigraphy, Palaeontology, Geophysics, Engineering Geology, Tectonics, Economic Geology, Energy Sources

GEOMECHANICS

Rock and Soil Mechanics, Hydrogeology, Dams and Tunnels, Earthquake Engineering, Site Investigation, Risk Analysis, Waste Disposal

OCEANOGRAPHY

Physical, Chemical and Biological Oceanography, Marine Geology, Meteorology, Pollution and Environmental Issues, Coastal and Offshore Engineering

PHYSICAL GEOGRAPHY

Meteorology and Climatology, GIS, Mapping, Remote Sensing, The Quaternary, Hydrology, Soil Science, Global Change, Environmental Pollution, Geomorphology, Sedimentology

HUMAN GEOGRAPHY

Environmental Resources, Demography, Culture, Politics, Rural and Urban Studies, National, Regional and Community Planning, Environmental Planning, Trade and Development, Agriculture, Industry, Transport, Tourism, Historical Geography

INTERNATIONAL DEVELOPMENT

Environment, Agriculture, Natural Resources, Economic Reform, Investment, Industry, Demography, Urbanisation and Housing, Health and Food, Education, Poverty, Gender, Culture, Aid, Trade, International Relations, Politics

ECOLOGY

Terrestrial Ecology, Aquatic Ecology (Marine, Estuarine and Freshwater), Microbial Ecology, Conservation, Applied Ecology (including Agriculture, Fisheries, Forestry, Pests/Diseases and Pollution), Evolution, Palaeoecology

Or visit us at
BOOTH 502
GSA, Seattle,
Washington,
2-5 November 2003

For further details check out our website at:
www.elsevier.com/locate/geobase

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
213	8 a.m.	T35. Geoscience Innovation Fostering the Achievement of All Students: Curriculum and Pedagogy Methods Reform, Universal Design Principles, and Applications (GSA Geoscience Education Division; Council of Undergraduate Research; National Association of Geoscience Teachers)	2B
214	8 a.m.	T37. Teaching Local Geology: An NAGT Session In Honor of Robert Christman (National Association of Geoscience Teachers)	2A
215	8 a.m.	T52. Twenty Years of Exploration and Innovation in Quantitative Hydrogeology: In Honor of Ed Sudicky I (GSA Hydrogeology Division)	606
216	8 a.m.	T53. Watershed-Based Research and Education: The State of the Science (GSA Hydrogeology Division; GSA Geoscience Education Division; GSA Quaternary Geology and Geomorphology Division; Geochemical Society)	608
217	8 a.m.	T58. Saturated and Vadose Zone Hydrogeology, Environmental Geology, and Biogeochemistry of the Department of Energy Hanford Site in Southeastern Washington State (GSA Hydrogeology Division)	609
218	8 a.m.	T78. Gas Hydrate in the Natural Environment and Implications for Energy Resources, Seafloor Stability, Climate, and the Biology of the Deep Sea	204
219	8 a.m.	T80. The Impact of Crystal Chemistry in the Earth Sciences II: A Tribute to Charles T. Prewitt, Recipient of the 2003 Roebling Medal of the Mineralogical Society of America (Mineralogical Society of America)	Ballroom 6A
220	8 a.m.	T92. Advances in the Fossil Record of Insects and Other Terrestrial Arthropods (GSA Geobiology and Geomicrobiology Division; Paleontological Society; Paleontological Research Institute)	4C-4
221	8 a.m.	T98. Interhemispheric Records of Paleoclimate Change: Low Latitude Influences on the High Latitudes, or the Other Way Around, in Pole-Equator-Pole Syntheses (GSA Quaternary Geology and Geomorphology Division; International Geosphere/Biosphere Program—Past Global Changes)	611/612
222	8 a.m.	T107. Records of Quaternary Landscape Change in the Rocky Mountains (GSA Quaternary Geology and Geomorphology Division)	613/614
223	8 a.m.	T121. Fortieth Anniversary of Sloss's Cratonic Sequences: Sequence Stratigraphy of the Sauk Sequence (GSA Sedimentary Geology Division)	602/603/604
224	8 a.m.	T125. Geology and Paleoecology of the Beringian Subcontinent: To Honor the Career of David M. Hopkins (Alaska Quaternary Center)	618/619/620
225	8 a.m.	T133. Exhumation Along Major Continental Strike-Slip Fault Systems (Posters) (GSA Structural Geology and Tectonics Division)	Hall 4-F
226	8 a.m.	T134. The Columbia River Flood Basalts: New Insights into the Volcanism, Petrology, and Tectonism of a Large Igneous Province: Dedicated to Peter Hooper on His Retirement (Posters) (Mineralogical Society of America; GSA Structural Geology and Tectonics Division)	Hall 4-F
227	8 a.m.	T135. Hydrothermal Alteration on Active Volcanoes: Processes, Rates, and Applications to Hazards and Resources (Society of Economic Geologists)	615/616/617
228	8 a.m.	T139. Granites at Convergent Margins: Physical and Chemical Constraints on Processes and Petrogenesis (Posters) (Mineralogical Society of America)	Hall 4-F
229	8 a.m.	T141. Phase Relations, High <i>P-T</i> Terrains, <i>P-T</i> -ometry and Plate Pushing IV: A Tribute to W.G. Ernst (Mineralogical Society of America)	Ballroom 6C
230	8 a.m.	T146. Collisional Tectonics of the Northwest Cordillera: Integration of New Data in Basin Development, Magma Petrogenesis, Geophysics, Structural, and Metamorphic Analysis (Posters) (GSA Structural Geology and Tectonics Division)	Hall 4-F
231	8 a.m.	T148. The Cascade Volcanic Arc System (Posters)	Hall 4-F
232	1:30 p.m.	Geochemistry, Aqueous II: Geochemistry of Water, Sediments, and Soils	3A
233	1:30 p.m.	Geoscience Education III: Issues and Opportunities at the Programmatic Level	2B
234	1:30 p.m.	Hydrogeology (Posters) II: Physical Hydrogeology	Hall 4-F
235	1:30 p.m.	Hydrogeology (Posters) III: Mass Transport and Hydrogeochemistry	Hall 4-F
236	1:30 p.m.	Marine/Coastal Science	3B

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
237	1:30 p.m.	Mineralogy/Crystallography (Posters)	Hall 4-F
238	1:30 p.m.	Neotectonics/Paleoseismology (Posters)	Hall 4-F
239	1:30 p.m.	Paleoclimatology/Paleoceanography II	400
240	1:30 p.m.	Paleontology/Paleobotany VI: Paleobotany: Systematics, Ecophysiology, and Paleoclimate	4C-3
241	1:30 p.m.	Paleontology/Paleobotany VII: Macroecology, Sampling Issues, and Preservational Bias	4C-4
242	1:30 p.m.	Petrology, Metamorphic and Experimental	611/612
243	1:30 p.m.	Precambrian Geology	307/308
244	1:30 p.m.	Sediments, Carbonates (Posters)	Hall 4-F
245	1:30 p.m.	Sediments, Clastic II	608
246	1:30 p.m.	Structural Geology II: Deformation Processes	615/616/617
247	1:30 p.m.	P7. The Science of Lewis and Clark: Historical Observations and Modern Interpretations (<i>GSA Engineering Geology Division; U.S. Geological Survey; U.S. Department of the Interior; GSA History of Geology Division; History of Earth Science Society [HESS]</i>)	Ballroom 6B
248	1:30 p.m.	T6. Geology of Salmon	613/614
249	1:30 p.m.	T39. History and Future of the Relationship Between the Geosciences and Religion: Litigation, Education, Reconciliation?	2A
250	1:30 p.m.	T52. Twenty Years of Exploration and Innovation in Quantitative Hydrogeology: In Honor of Ed Sudicky II (<i>GSA Hydrogeology Division</i>)	606
251	1:30 p.m.	T53. Watershed-Based Research and Education: The State of the Science (Posters) (<i>GSA Hydrogeology Division; GSA Geoscience Education Division; GSA Quaternary Geology and Geomorphology Division; Geochemical Society</i>)	Hall 4-F
252	1:30 p.m.	T72. A Century of Hydrogeologic Investigations and Groundwater Modeling in the Great Basin: What Have We Learned? (<i>GSA Hydrogeology Division; U.S. Geological Survey</i>)	607
253	1:30 p.m.	T78. Gas Hydrate in the Natural Environment and Implications for Energy Resources, Seafloor Stability, Climate, and the Biology of the Deep Sea (Posters)	Hall 4-F
254	1:30 p.m.	T80. The Impact of Crystal Chemistry in the Earth Sciences (Posters): A Tribute to Charles T. Prewitt, Recipient of the 2003 Roebling Medal of the Mineralogical Society of America (<i>Mineralogical Society of America</i>)	Hall 4-F
255	1:30 p.m.	T100. Wetland Science: Intersection of Hydrogeology, Geomorphology, Ecology, and Computer Modeling (<i>GSA Hydrogeology Division; USDI—Geological Survey; Montana State University</i>)	609
256	1:30 p.m.	T122. Clinoforms: Past, Present, and Modeled (<i>GSA Sedimentary Geology Division; SEPM—Society for Sedimentary Geology</i>)	602/603/604
257	1:30 p.m.	T131. Seismogenic Friction and Pseudotachylites (<i>GSA Structural Geology and Tectonics Division; GSA Geophysics Division</i>)	618/619/620
258	1:30 p.m.	T138. From Oxides to Anorthosites: A Tribute to D.H. Lindsley (Posters) (<i>Mineralogical Society of America</i>)	Hall 4-F
259	1:30 p.m.	T140. Modeling Metamorphism: Petrology, Geochemistry, and Tectonics (Posters) (<i>Mineralogical Society of America; Geochemical Society; GSA Structural Geology and Tectonics Division</i>)	Hall 4-F
260	1:30 p.m.	T141. Phase Relations, High <i>P-T</i> Terrains, <i>P-T</i> -ometry and Plate Pushing (Posters): A Tribute to W.G. Ernst (<i>Mineralogical Society of America</i>)	Hall 4-F
261	1:30 p.m.	T142. Structure and Stratigraphy: New Perspectives on Lithotectonic Processes (<i>GSA Structural Geology and Tectonics Division; GSA Sedimentary Geology Division</i>)	Ballroom 6C
262	1:30 p.m.	T148. The Cascade Volcanic Arc System	Ballroom 6A
263	1:30 p.m.	T150. New Views of Seismic Hazard in Cascadia I: Seismology and Seismotectonics (Posters) (<i>GSA Geophysics Division</i>)	Hall 4-F

Graduate School Information Forum

Washington State Convention & Trade Center, Hall 4D
 Sun., Nov. 2, 8:30 a.m.–3:45 p.m.; Mon.–Wed., Nov. 3–5, 8:30 a.m.–5:30 p.m.

Searching for the right graduate school? Meet with university representatives from across the nation at GSA's Graduate School Information Forum. The schools participating (as of press time) are listed below. For a complete list of schools, contact Kevin Ricker at (303) 357-1090, kricker@geosociety.org. To check if a school has a booth in the Exhibit Hall, go to www.geosociety.org/meetings/2003/exhibits.htm.

INSTITUTION	SUN.	MON.	TUES.	WED.	INSTITUTION	SUN.	MON.	TUES.	WED.
Binghamton University		x			University of California at Davis	x	x	x	
Boise State University		x	x		University of California at Riverside	x	x	x	
Central Washington University	x	x			University of Chicago				x
Clemson University		x			University of Illinois			x	
Colorado School of Mines	x	x			University of Iowa			x	
Cornell University		x			University of Idaho			x	
East Carolina University	x	x			University of Maryland			x	x
Idaho State University		x	x		University of North Carolina—Chapel Hill	x	x		
Illinois State University	x	x			University of Oklahoma	x	x	x	
Indiana University	x	x	x	x	University of Tennessee—Knoxville	x	x		
Kent State University	x	x	x		University of Texas—El Paso	x	x	x	
New Mexico Institute of Mining & Technology		x			University of Wisconsin—Madison	x	x	x	
New Mexico State University		x			University of Wyoming	x	x	x	x
North Carolina State University	x	x			Utah State University	x	x		
Northern Arizona University		x			Vanderbilt University			x	
Northwestern University		x			Virginia Tech	x	x	x	
Oklahoma State University	x	x	x		Washington State University	x	x	x	
Old Dominion University	x	x			Western Michigan University	x			
Penn State University		x			Wright State University	x	x		
Rice University		x	x		Yale University	x			x
Simon Frasier University			x						
Syracuse University	x	x	x						
Texas A&M University	x	x							
University of Alaska—Fairbanks		x	x						

Registration

You can still register online, by mail, or by fax until October 24 at on-site rates. (Preregistration ended September 26.)

- Online:** www.geosociety.org
- By mail:** GSA
P.O. Box 9140
Boulder, CO 80301-9140
- By fax:** 303-357-1071

Registrations will NOT be accepted via mail, fax, or phone after October 24. You will be required to register on-site at the meeting.

Did you preregister before September 26?

If you live within the United States, your badge will be mailed to you approximately 2 weeks before the meeting. You will need to pick up your badge holder and program at the GSA Preregistration Desk located in the Washington State Convention & Trade Center, South Lobby—Level 4, beginning Saturday, November 1, at 7 a.m. For your convenience, a pick-up desk with badge holders and programs will also be available in the Sheraton Seattle Hotel, second floor.

Did you register after September 26, or are you located outside the United States?

You will need to pick up your badge, badge holder, and program on-site at the GSA Preregistration Desk located in the Washington State Convention & Trade Center, South Lobby—Level 4, beginning Saturday, November 1, at 7 a.m.

Air Travel

Seattle-Tacoma International Airport (Sea-Tac) is about 30 minutes (or more, depending on traffic) from downtown Seattle.

The following airlines have been contracted to provide convention rates to and from Seattle for the GSA Annual Meeting & Exposition. You can save up to 15% on published airfares by booking through the group reservation desks at the numbers listed below.

ALASKA AIRLINES

1-800-445-4435

Meeting ID #CMR6375

Alaska Airlines is offering discounts of 10% off published excursion fares, except companion and other promotional fares. Call the Alaska Airlines Meeting Department at 1-800-445-4435 and reference meeting ID number **CMR6375** to book your discounted travel.

SOUTHWEST AIRLINES

1-800-433-5368

Meeting ID #U0216

Southwest Airlines offers up to 10% off most fares for air travel to and from the event, with the convenience of Ticketless Travel. To qualify, call Southwest Airlines Group and Meetings Reservations at 1-800-433-5368 and reference meeting ID number **U0216**. Reservations sales agents are available 7 a.m.–8 p.m., Monday–Friday, or 8:30 a.m.–5:30 p.m., Saturday and Sunday, Central Standard Time.

UNITED AIRLINES

1-800-521-4041

Meeting ID #516BG

United is offering a 10% discount off the unrestricted, fully refundable coach fare or a 5% discount off the lowest applicable fares, including first class, to all attendees of the GSA Annual Meeting. An additional 5% discount will apply when tickets are purchased at least 30 days in advance of travel. This special offer applies to travel on domestic segments of all United Airlines and United Express flights. United's schedule and discounted fares are available through United's Meeting Desk or your travel agent. Call 1-800-521-4041 and reference meeting ID number **516BG**. Dedicated reservationists are on duty seven days a week, 8 a.m.–10 p.m. Eastern Standard Time.

Transportation Options to & from Sea-Tac

CAR RENTAL

Alamo Rent-A-Car

1-800-732-3232 or www.alamo.com

Group ID # 699477

Plan Code: GR

Alamo Rent-A-Car will provide convention rates from \$33 per day to \$149 per week (and up), with no charge for an additional driver. Attendees can call or book online. Reference group ID number **699477** and plan code **GR**.

SHUTTLE SERVICE

Grayline Airport Express

Grayline Airporter bus service offers daily door-to-door service from Sea-Tac Airport to the following downtown hotels: Sheraton, Hilton, Renaissance, Crowne Plaza, Four Seasons, Roosevelt, Cavanaugh's, Paramount, Warwick, Westin, and the Greyhound Depot. Departs twice an hour. Boarding locations at Sea-Tac: North Booth—outside the United Airlines baggage claim area, and South Booth—outside the International baggage claim area (covers Northwest and TWA).

Current prices are \$8.50 one-way for adults and \$14.00 round-trip for adults. These prices are subject to change. For more information, please call (206) 626-6088.

Shuttle Express

Shuttle Express offers the following transportation options:

Execucar—Private, nonstop services to and from Sea-Tac Airport. Execucar's spacious Lincoln Town Cars offer "Meet and Greet" services at the Sea-Tac baggage claim area for arriving guests (with advanced reservations), as well as baggage service—your driver will take care of everything, and will arrive at your requested time. The fare is \$45.00 to downtown Seattle for up to four people.

Charters—Private, nonstop service to and from Sea-Tac airport. After collecting your luggage, please proceed to the nearest Traveler's Information Center (adjacent to the escalators). Pick up the phone and press 48. You will be connected to a Shuttle Express reservationist who will direct you to an inside waiting area. The driver will arrive in less than 30 minutes, call you by your last name, and escort you to a seven-passenger Dodge van. The fare to downtown Seattle is \$44.00 for up to seven people.

Door-to-Door—After collecting your luggage, please proceed to the nearest Traveler's Information Center. Pick up the phone and press 48. You will be connected to a Shuttle Express reservationist who will direct you to an inside waiting area. The driver will arrive in less than 30 minutes, call you by your last name, and escort you to a share-a-ride van. Vans leave Sea-Tac on demand; therefore, an advanced reservation is not necessary. The fare is \$20.00 for the first person, and \$4.00 for each additional person.

TAXI

Average rate: \$30–\$40 one-way

Transportation Options in Seattle

GSA will **NOT** be providing shuttle service from the hotels to the convention center this year, but Seattle does have the following inexpensive—or free—options for getting around downtown.

DOWNTOWN BUSES

Metro buses are free from 6 a.m. to 7 p.m. in the downtown Ride Free zone that extends from First Avenue to Sixth Avenue off the I-5 Freeway, between Jackson on the south and Bell on the north. You can also purchase a one-day pass for only \$2.50 for travel anywhere on the system. For additional Metro bus information, please call (206) 553-3000.

**NATIONAL BOOK AWARD FINALIST
WHEN SMOKE RAN LIKE WATER**

Tales of Environmental Deception and the Battle Against Pollution
Devra Davis

Basic Books, December 2003, 336 Pages, 0-465-01522-0, \$16.00, pb

THE LONG SUMMER

How Climate Changed Civilization
Brian Fagan

Basic Books, December 2003, 304 Pages, 0-465-02281-2, \$26.00, hc

COAL

A Human History
Barbara Freese

Basic Books, December 2002, 320 Pages, 0-7382-0490-5, \$25.00, hc

IN THE BLINK OF AN EYE

Andrew Parker

Basic Books, March 2003, 336 Pages, 0-7382-0607-5, \$24.95, hc

THE MAN WHO FOUND TIME

James Hutton and the Discovery of Earth's Antiquity
Jack Repcheck

The story of the Edinburgh farmer who discovered that the earth was millions of years old, not six thousand.

Basic Books, April 2003, 256 Pages, 0-7382-0692-X, \$26.00, hc

Now in paperback with a New Preface

FIRE IN THE TURTLE HOUSE

The Green Sea Turtle and the Fate of the Ocean
Osha Gray Davidson

PublicAffairs, July 2003, 272 Pages, 1-58648-199-1, \$15.00, pb

ELEPHANT DESTINY

Biography of an Endangered Species in Africa
Martin Meredith

"Highly recommended . . . because of the depth of the author's research and experience."—*Library Journal*

PublicAffairs, March 2003, 264 Pages, 1-58648-077-4, \$24.95, hc

SEA LEGS

Tales of a Woman Oceanographer
Kathleen Crane

The personal history of a pioneer woman oceanographer and her role in the development of science during the Cold War.

Westview Press, January 2003, 328 Pages, 0-8133-4004-7, \$27.50, hc

KING OF FISH

The Thousand-Year Run of Salmon
David R. Montgomery

A passionate recounting of the natural history of the rise and fall of salmon in England, New England, and the Pacific Northwest.

Westview Press, September 2003, 288 Pages, 0-8133-4147-7, \$26.00, hc

NOW IN PAPERBACK!

PLATE TECTONICS

An Insider's History of the Modern Theory of the Earth
Naomi Oreskes

"An important historical record."—*Library Journal*

Westview Press, January 2003, 448 Pages, 0-8133-4132-9, \$30.00, pb

NOW IN PAPERBACK!

THE EARTH AROUND US

Maintaining a Livable Planet
Jill Schneiderman

Westview Press, January 2003, 480 Pages, 0-8133-4091-8, \$30.00, pb

5500 Central Avenue, Boulder, CO 80301

P: 303-444-3541 • F: 720-406-7336 • Toll-free: 1-800-386-5656, orders only

Travel & Transportation

MONORAIL

The Monorail departs every 10 minutes for a two-minute ride between Seattle Center and Westlake Center. The cost is \$1.50 one-way or \$3.00 round-trip for adults. Hours of operation are Monday–Friday, 7:30 a.m.–11 p.m., and Saturday and Sunday, 9 a.m.–11 p.m. For additional information, please check the Seattle Center Monorail Web site at www.seattlemonorail.com.

General Meeting Information

ACCESSIBILITY FOR REGISTRANTS WITH SPECIAL NEEDS

GSA is committed to making the Annual Meeting accessible to all people interested in attending. If you need auxiliary aids or services because of a disability, check the appropriate box on the registration form. If you have suggestions or need further information, contact Kevin Ricker, kicker@geosociety.org, (303) 357-1090. Please let us know your needs by October 15.

TOURIST INFORMATION

For general information about sightseeing, accommodations, restaurants, and shopping in Seattle, visit www.seeseattle.org, or see the GSA Meeting Web site for additional area information.

WEATHER & CLIMATE

Because two mountain ranges flank the city of Seattle, the climate is temperate year-round, and gardens thrive even in mid-winter. The average daily temperature in November is 51° Fahrenheit, with an expected 5.08 inches of precipitation for the month.

**Halbouty Distinguished Lecture
to be Presented during the
GSA Annual Meeting in Seattle**

The 2003 Halbouty Distinguished Lecturer, Ward Chesworth, University of Guelph, Ontario, will present his lecture, "Bread from Stones," at the 2003 GSA Annual Meeting in Seattle. Add this special presentation to your personal schedule. **You won't want to miss it!**

**2003 Halbouty Distinguished Lecture
Tuesday, November 4
1:30–2:30 p.m.**

**Washington State Convention & Trade Center,
Rm. 607**

The Michel T. Halbouty Distinguished Lecturer was selected from abstracts submitted in the Engineering Geology discipline for the 2003 GSA Annual Meeting in Seattle.



**Breakfast with GSA's
Executive Director
and Incoming
President**

**Guest Hospitality Suite
Washington State Convention
and Trade Center,
Room 201 * Monday, 8 a.m.**

Come to the Guest Hospitality Suite to meet GSA Executive Director Jack Hess and incoming GSA President Rob Van der Voo.

Breakfast will be provided for those guests who have paid the \$80 guest program registration fee.



Geochron Laboratories

a division of Krueger Enterprises, Inc.

- More than 40 years experience
- High quality radiometric dating and stable isotope analyses
- Ultra low level QUANTULUS 1220 spectrum analyses counters

Radiocarbon conventional and AMS methods

Tritium direct counting

Light stable isotopes $\delta^2\text{H}$, $\delta^{13}\text{C}$, $\delta^{15}\text{N}$, $\delta^{18}\text{O}$, $\delta^{34}\text{S}$

Rb-Sr, U-Pb, Sm-Nd age determinations

Heavy isotopes $^{87}\text{Sr}/^{86}\text{Sr}$ high and ultra high precision

Pb isotopes (excluding ^{210}Pb)

$^{144}\text{Nd}/^{143}\text{Nd}$ isotope analyses

Visit our web site at www.geochronlabs.com

711 Concord Avenue

Cambridge, MA 02138-1002 USA

t: 617-876-3691 f: 617-661-0148

e-mail: staff@geochronlabs.com

Guest Program—Tours & Seminars

Guest Hospitality Suite

**WASHINGTON STATE CONVENTION & TRADE CENTER, ROOM 201
SUNDAY–WEDNESDAY, 8 A.M.–5:30 P.M.**

The guest or spouse registration fee of \$80 per person is for nongeologist spouses or friends of professional and/or student meeting registrants. The guest registration fee is required for those attending all guest tours or seminars, for access to the Exhibit Hall, and for refreshments in the Guest Hospitality Suite. The guest registration fee will NOT provide access to technical sessions; however, guests wishing to see a specific presentation should sign in with the hostess in the Guest Hospitality Suite. Refreshments in the Guest Hospitality Suite are reserved only for those who have paid the guest registration fee of \$80.

Seminars

Payment of the guest registration fee entitles you to also attend the Guest Seminars offered for no additional charge.

WELCOME TO SEATTLE

Monday, 10–11 a.m.

Washington State Convention & Trade Center, Room 305

LAUGHTER—GOOD MEDICINE FOR THE SOUL

Tuesday, 10–11 a.m.

Washington State Convention & Trade Center, Room 305

THE WORLD OF WASHINGTON STATE WINES

Wednesday, 9–10 a.m.

Washington State Convention & Trade Center, Room 305

Tours

You must be registered for either the entire GSA meeting or the Guest Program in order to participate in guest tours, seminars, and activities.

All guest tours depart from and return to the Washington State Convention & Trade Center, Level 1, Convention Place. Please arrive 15 to 20 minutes before the scheduled departure time.

DESCRIPTION	TIME	COST
SATURDAY		
Bird Watching [101]	7 a.m.–noon	\$35
MONDAY		
Seattle City Highlights-Deluxe Full Day Tour [102]	8 a.m.–2 p.m.	\$68
Experience Music Project and the Space Needle [103]	9 a.m.–noon	\$45
Seattle City Highlights—Half Day Tour [104]	1–5 p.m.	\$27
TUESDAY		
Snoqualmie Falls and Wine Tasting [105]	10 a.m.–4 p.m.	Full
The Art of Glassblowing: Seattle Art and Gallery Tour [106]	2–5 p.m.	\$38
Seattle Aquarium and Pacific Science Center [107]	11 a.m.–3:30 p.m.	\$52

REGISTER ONLINE AT WWW.GEOSOCIETY.ORG!

HOTELS

Seattle Hotels



Designed for Geologists Like Me

I am a GEOLOGIST

and it's essential to have up-to-date, quality information, but in a way that suits my needs. Because I am often away from my desk, I need to make sure that the articles I need come to me – that's why the alerting services on ScienceDirect are so great. I can set alerts on new journal issues, searches I've run or when someone else cites my own research papers.

That's why I use ScienceDirect

Over 60 leading journals including:

- **Earth Science Reviews**
- **Sedimentary Geology**
- **Palaeogeography, Palaeoclimatology, Palaeoecology**
- **Marine Geology**

Over 40,000 peer-reviewed, full-text articles.

Links take you seamlessly from the bibliographic references to the abstract or full text.

Customizable alerting services let you pinpoint the information you need to keep up-to-date.

www.sciencedirect.com



Visit Us at GSA Annual Meeting 2003
Booth 502, November 2-5



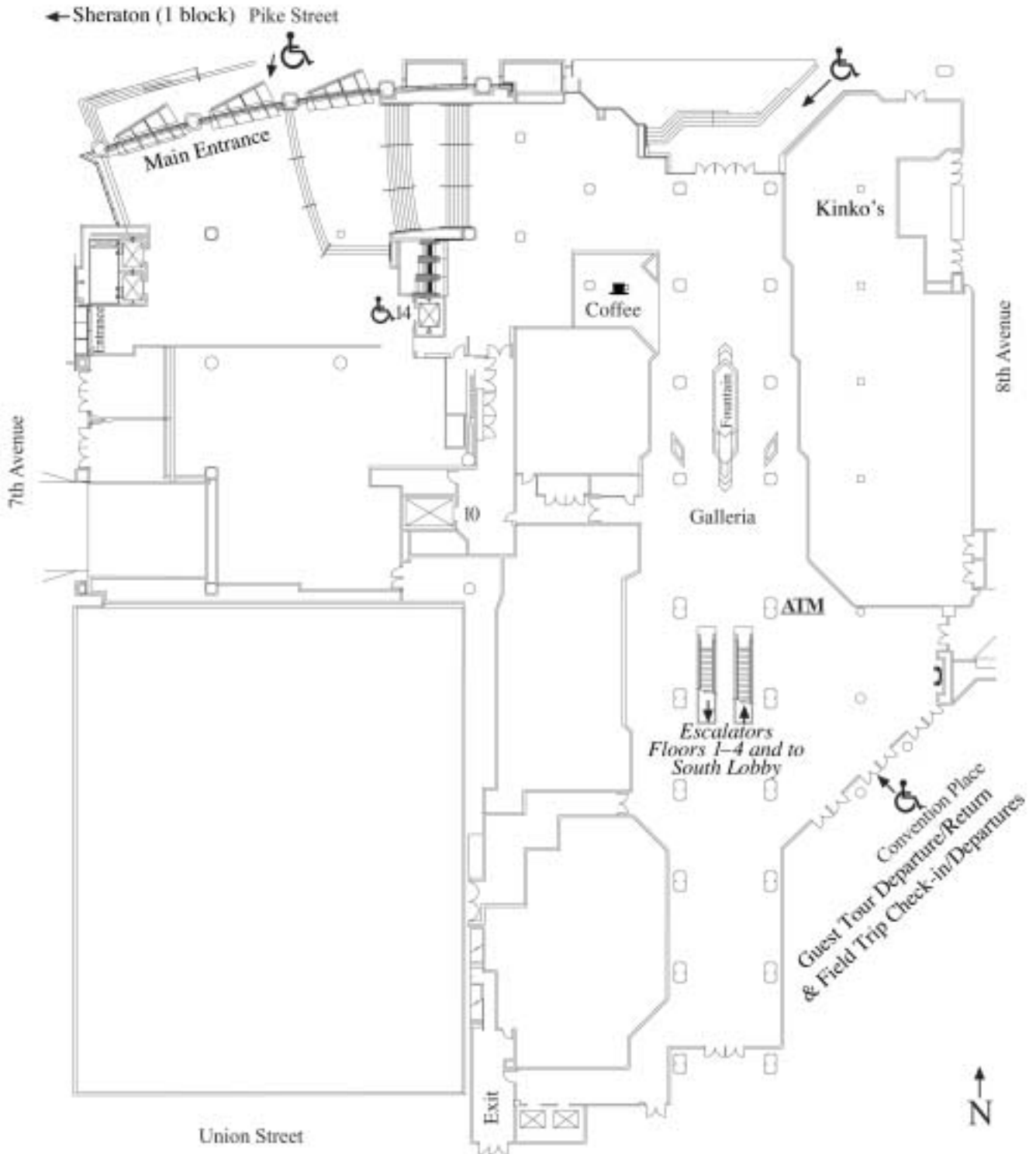
SCIENCE @ DIRECT®

9 million researchers have
access to ScienceDirect
...Are you one of them?

FLOOR PLANS

Convention & Trade Center

Washington State Convention & Trade Center
Level One



Crystal Clear.

The Meiji EM Series of Modular Stereo Microscopes.

If you are looking for precision, durability, quality and value in a Stereo Microscope, we invite you to take a closer look at Meiji's EM Series of Stereo Microscopes.

The modular design (A wide variety of bodies, single magnification or zoom - rotatable 360°, auxiliary lenses, eyepieces, stands, holders, etc.) gives you the freedom to create the ideal instrument for your specific need or application, and Meiji stands behind every instrument with its "Limited Lifetime Warranty."

For more information on these economically priced Stereo Microscopes, please call, FAX, write us or log on to our website today.

MEIJI TECHNO AMERICA

2186 Bering Drive, San Jose, CA 95131,

Tel: 408.428.9654, FAX: 408.428.0472

Toll Free Telephone: 800.832.0060 or visit our website at www.meijitechno.com



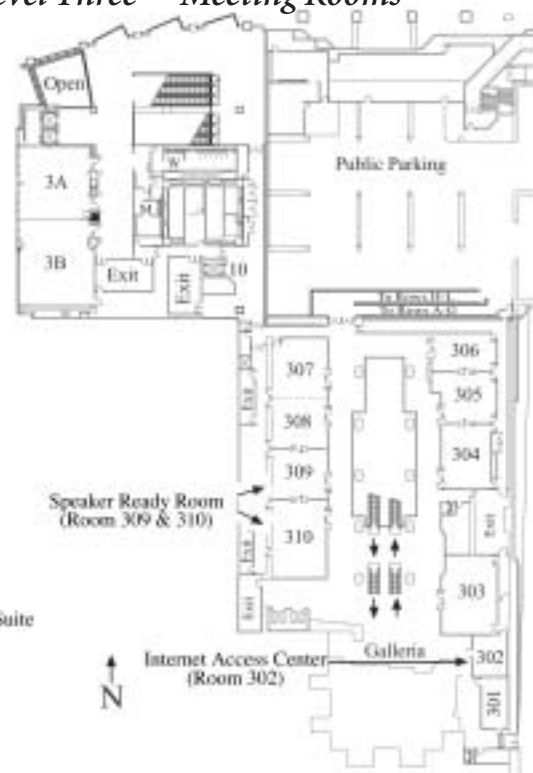
Convention & Trade Center



Level Two—Meeting Rooms



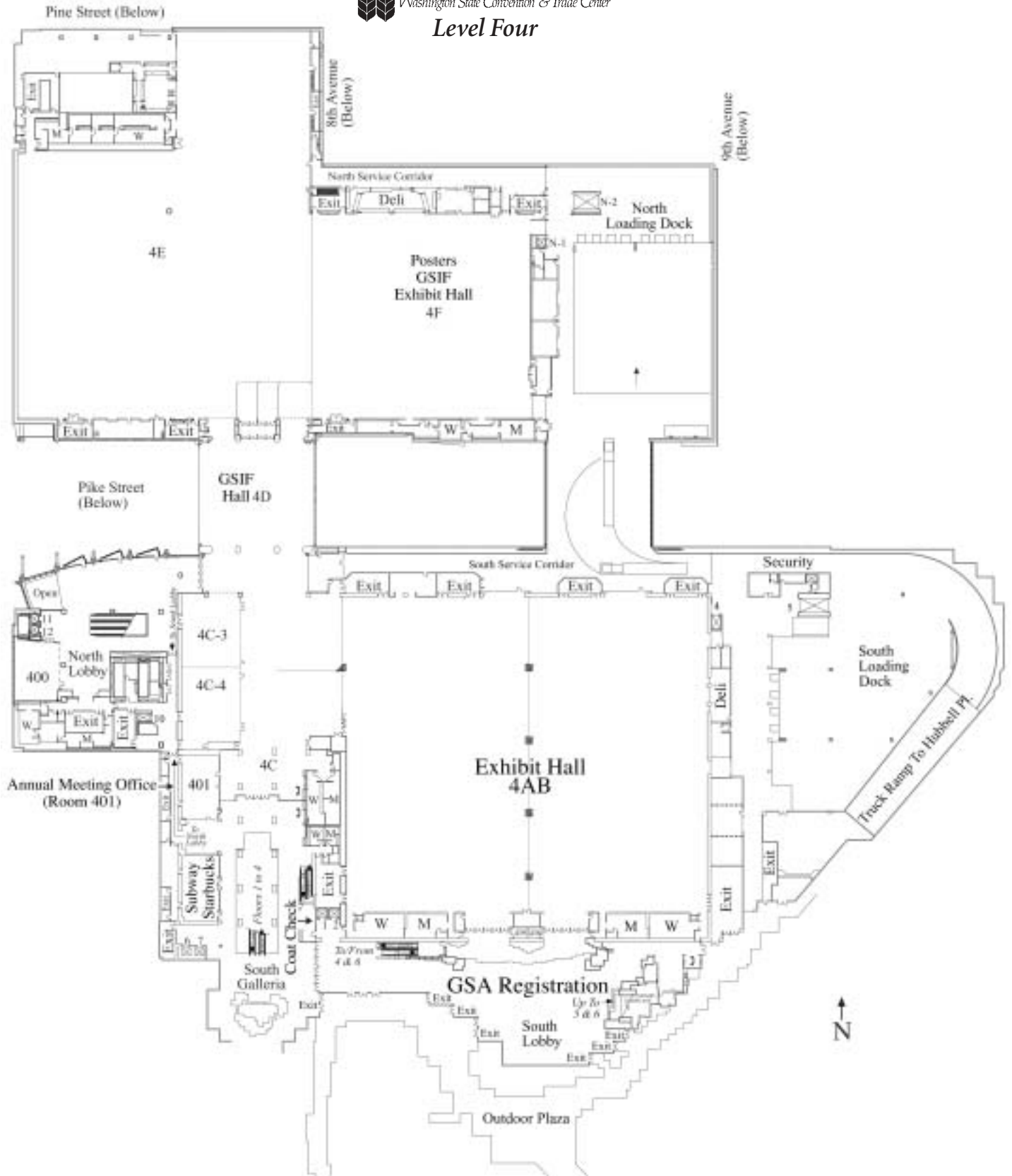
Level Three—Meeting Rooms

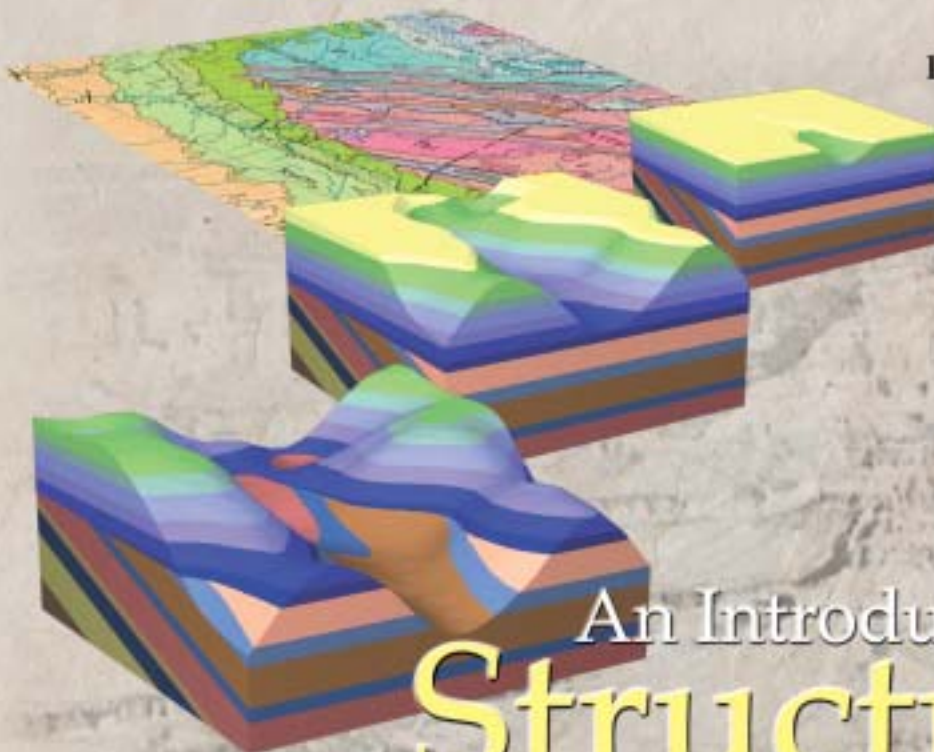


FLOOR PLANS

Convention & Trade Center

Washington State Convention & Trade Center
Level Four





Interactive CD-ROM

An Introduction to Structural Methods

by H. Robert Burger and Tekla A. Harms

An Introduction to Structural Methods is a valuable aid for teaching structural geology to college-level students. Richly illustrated with detailed animations, 3-D diagrams, photographs, and interpretive geologic maps in full color, the CD-ROM is intended as a supplement to structural geology textbooks. Narrated by the authors, this program is also useful for self-directed study by presenting the material in an instructional step-by-step format. Each section concludes with interactive quizzes to test students' comprehension and mastery of section topics.

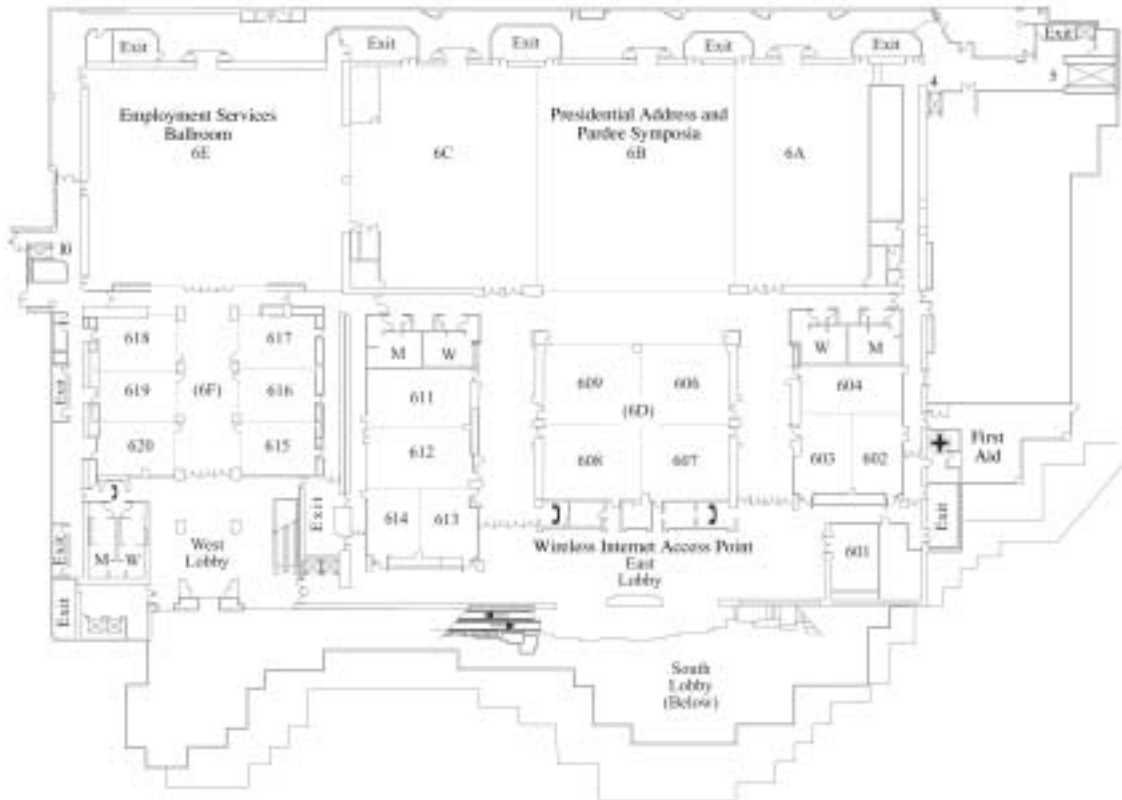
The variety of innovative media available on this CD-ROM will help students improve their spatial reasoning skills as they apply structural concepts and techniques. For example, students can interactively manipulate animated 3-D block diagrams of dipping strata undergoing stream incision to derive the "Rule of V's" by observing the differing effect of upstream versus downstream dip on the horizontal map pattern.

To view selected frames from *An Introduction to Structural Methods*, and for detailed information about the program and how to order it, visit our website: www.TasaGraphicArts.com, or call (800) 293-2725.



Convention & Trade Center

 Washington State Convention & Trade Center
Level Six



GSA International Geology Division: New Members Sought

The International Division plays a key role as GSA expands its activities in global geology. If you are interested in GSA's global initiative and in working with international geoscientists, consider becoming a member of the International Division. Current members of the Division include those whose research involves academia and applied geology interests that have led them to other countries and those whose scientific activities reach across U.S. borders.

Increased membership will allow expansion of travel award programs to partially fund overseas geoscientists so they may participate in and enrich technical sessions at GSA Annual Meetings. To join, check the International Division box on the 2004 renewal form. If you've already renewed, contact GSA Sales & Service at gsaservice@geosociety.org or (303) 357-1000, option 3. Or, stop by the GSA Member Services booth or the International Division booth in the Exhibit Hall at the GSA Annual Meeting in Seattle. For information about International Division activities planned at the annual meeting, please view the summer newsletter posted at www.geosociety.org/sectdiv/idiv/.

The primary objectives of the International Division are to:

1. Help fund travel of overseas scientists attending the annual meeting and selected overseas meetings;

2. Coordinate and sponsor meetings, symposia, conferences, and lectures on the geology of regions beyond North America, particularly at the GSA annual meeting;
3. Act as a clearing center for distribution of American journals and books to under-funded overseas institutions; and
4. Strengthen cooperation with overseas geoscience societies to support and help raise funds for projects such as international exchanges of professors, other geoscientists, and students, joint meetings, volunteer training courses, and assistance in effective English translations.

Donations Sought

The International Division welcomes donations to provide additional funds for travel for international attendees at the GSA meeting in Seattle and for financing an expanded reception for international participants. Please send your donation to GSA Foundation, attention International Division.

Vision

Division officers are actively seeking ideas and comments on how the division can further serve the international goals of GSA and its international membership. Send suggestions to Division President Dean Kleinkopf, md.kleinkopf@att.net; First Vice-President Mark Cloos, cloos@mail.utexas.edu; Second Vice-President Pinar O. Yilmaz, pinar.o.yilmaz@exxonmobil.com; or Immediate Past-President Lee Allison, lallison@kgs.ukans.edu.



HOT TOPICS

Washington State
Convention & Trade
Center, Room 611/612
Sunday–Wednesday

Join your colleagues for spirited lunchtime discussion and debate on several burning issues for the professional geologic community.

Sunday, November 2
noon–12:45 p.m.

**Public Education:
What is the Role of the
Scientist in Influencing
the Teaching of Evolution
vs. Creationism
vs. Intelligent Design?**

Monday, November 3
12:15–1:15 p.m.

**Human Space Exploration—
Should We Continue?**

Tuesday, November 4
12:15–1:15 p.m.

**Natural Hazards of the
Pacific Northwest**

Wednesday, November 5
12:15–1:15 p.m.

**Sustainability, Energy
Alternatives, and
Dependency on Mideastern
Petroleum Reserves**

**Hot Topics Chair:
Frederick L. Schwab**

Washington and
Lee University
Lexington, Kentucky



On the Cutting Edge

2003-04 Workshops for Geoscience Faculty

**Teaching Geoscience with Visualizations:
Using Images, Animations, and Models Effectively**
February 26-28, 2004, Carleton College, Northfield, MN
application deadline: December 18

Geology and Public Health
May 12-15, 2004, Chico Hot Springs, Chico, MT
application deadline: December 15

**Early Career Faculty Workshop: Teaching,
Research, and Managing Your Career**
June 12-17, 2004, College of William and Mary, Williamsburg, VA
application deadline: March 17

Teaching Structural Geology in the 21st Century
June 26-July 2, 2004, Smith College, Northampton, MA
application deadline: January 15

**Designing Effective and Innovative
Courses in the Geosciences**
July 21-25, 2004, Central Michigan University, Mt. Pleasant, MI
application deadline: March 17

Preparing for an Academic Career in the Geosciences
July 29-August 1, 2004, University of Minnesota, St. Paul, MN
application deadline: March 24

Related Activities

<p>Integrating Important Advances in Planetary Geoscience into Undergraduate Courses one-day workshop at Seattle GSA meeting, Saturday, November 1, 2003</p>	<p>Using Data to Teach Earth Processes: An Illustrated Community Discussion special poster session at Seattle GSA meeting, Sunday, November 2, 2003</p>
---	--

More information plus on-line applications for all workshops
can be found at <http://serc.carleton.edu/NAGTWorkshops/>

Pardee Keynote Symposia

Washington State Convention and Trade Center, Ballroom 6B

The Pardee Keynote Symposia are special events of broad interest to the geoscience community. They represent topics on the leading edge in a scientific discipline or area of public policy, address broad fundamental issues, and are interdisciplinary. Selection was on a competitive basis. This year's seven Pardee Keynote Symposia were reviewed and accepted by the Annual Program Committee.

His View of Life: Reflections on the Scientific Legacy of Stephen J. Gould

Sun., Nov. 2, 8 a.m.–noon

**The Paleoenvironmental and Paleoclimatic
Framework of Human Evolution**

Mon., Nov. 3, 8 a.m.–noon

Modeling Metamorphism: Petrology, Geochemistry, and Tectonics

Mon., Nov. 3, 1:30–5:30 p.m.

**Global Climate Changes: Abrupt Late Pleistocene Climatic Reversals and
Modern Global Warming**

Tues., Nov. 4, 8 a.m.–noon

**Preservation of Random Mega-scale Events on Mars and Earth:
Influence on Geologic History**

Tues., Nov. 4, 1:30–5:30 p.m.

Neoproterozoic Geobiology: Fossils, Clocks, Isotopes, and Rocks

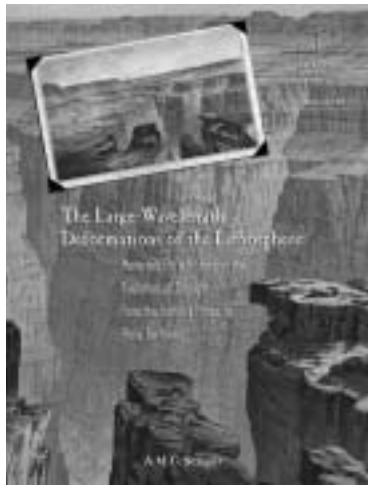
Wed., Nov. 5, 8 a.m.–noon

**The Science of Lewis and Clark: Historical Observations
and Modern Interpretations**

Wed., Nov. 5, 1:30–5:30 p.m.

*The Pardee Keynote Symposia are
made possible by a grant from the Joseph T. Pardee Memorial Fund.*

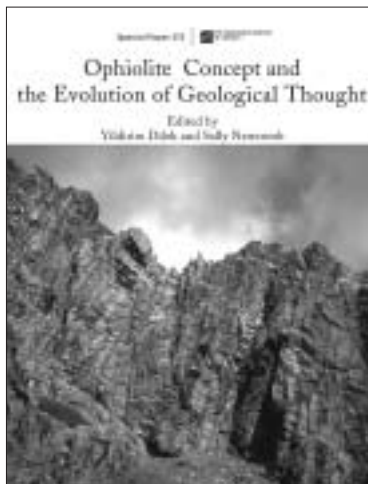
New at the GSA Bookstore



The large-wavelength deformations of the lithosphere: Materials for a history of the evolution of thought from the earliest times to plate tectonics, by A.M.C. Şengör
MWR196, 333 p. plus index, plates, ISBN 0-8137-1196-7 (in press, go online for price)

This Memoir takes readers on a fascinating journey that follows the development of ideas concerning large-wavelength lithospheric deformation that forms

broad uplifts and basins. The journey begins millennia ago with Middle Eastern and Asian mythology and ends with the plate tectonic revolution in the mid-twentieth century. Readers are treated to a multitude of legends, observations, and theories, along with a host of characters who have explored this subject, from Plato and Aristotle, through de Beaumont and Suess, to Cloos, Wilson, and Burke. In order to tell that story, Şengör has consulted an immense number and variety of sources, many from his own large collection of rare geological and historical texts. Whether you read this volume as a geologist or as a historian, you'll have an enjoyable journey tracing the connections between ancient mythology and modern concepts of large-wavelength deformation.



Ophiolite concept and the evolution of geological thought, edited by Yildirim Dilek and Sally Newcomb
SPE373, 470 p. plus index, plate, ISBN 1-8137-2373-6 (in press, go online for price)

Since their recognition as on-land remnant of fossil oceanic lithosphere, ophiolites have been a major component of the plate tectonics paradigm. Changing hypotheses about the occurrence, origin, and emplacement

of ophiolites mimic the broader advancement of the many facets of geology over 200 years. Continuing controversy over ophiolites raises fascinating scientific, historical, and philosophical questions in the evolution of geological thought. The papers in this book examine our current knowledge about ophiolites and their significance in geological studies through time and provide a historical perspective on many fundamental

problems and questions that have arisen as ophiolite studies have evolved. Presenting personal views of the authors on major developments in our understanding of ophiolites, papers in the first part of the volume make the critical connections between some of the important discoveries and the flow of events and personal communications among the scientists that led to these discoveries. Other papers present a thorough chronicle of major developments in ophiolite research and provide a probing critique of how these developments aided our understanding of key scientific problems and questions. Major topics include the classification schemes of ophiolites, the validity of ophiolite-ocean crust analogy based on marine geophysical data, definition of the Moho, magma chamber models and their evolution, the significance of the Troodos massif (Cyprus) in the evolving ophiolite concept, geology of supra-subduction zones, the concept of supra-subduction zone origin of ophiolites, petrofabric features of Alpine-type and Pacific-type metamorphic belts and their implications for the exhumation histories of convergent margin plate junctions, discovery of mélanges, and the history of asbestos discovery and use.

The collection in a single volume of divergent perspectives and opposing views on ophiolites and ophiolite studies through time makes this book a vivid account of the scientific process and a unique contribution to the history of science. The book will be of great interest to researchers and students working in the broad fields of petrology and geochemistry, marine geology and geophysics, and tectonics and geodynamics.

In Press

Evolution and dynamics of the Australian Plate, edited by R.R. Hillis and R.D. Müller
SPE372, 430 p. plus index, ISBN 1-8137-2372-8
\$90.00, member price \$72.00

This volume is co-published simultaneously with the Geological Society of Australia as Special Publication No. 22, Evolution and dynamics of the Australian Plate.

Recently Published Titles

Geology of a transpressional orogen developed during ridge-trench interaction along the North Pacific margin, edited by Virginia B. Sisson, Sarah M. Roeske, and Terry L. Pavlis
SPE371, 353 p. plus index, CD-ROM, ISBN 0-8137-2371-X
\$90.00, member price \$72.00

Extreme depositional environments: Mega end members in geologic time, edited by Marjorie A. Chan and Allen W. Archer
SPE370, 264 p. plus index, ISBN 0-8137-2370-1
\$80.00, member price \$60.00

GSA Publication Sales, P.O. Box 9140, Boulder, CO 80301-9140
www.geosociety.org
(303) 447-2020, 1-888-443-4472, fax 303-357-1071

Visit the GSA Bookstore at the Annual Meeting in Seattle.

Media Relations Generates Coverage of a Broad Array of Topics

Ann Cairns, GSA Director of Communications

GSA members care a great deal about promoting the geosciences. In the Society's 1999 general membership survey, raising public awareness of the value of geoscience ranked as members' #4 priority among all Society programs. In the 2003 survey, it ranked #2.

GSA has responded by augmenting its media relations activity in recent years. The result has been an increase in both the breadth and depth of geoscience reported. Following are some frequently asked questions about the Society's media relations program.

What does GSA do to stimulate media interest?

Each year, GSA Communications issues 50–60 media advisories and press releases. These releases highlight research published in GSA journals and presented at its meetings. Releases are distributed electronically to an extensive list of journalists. They're also posted on *EurekAlert*, the American Association for the Advancement of Science (AAAS) Web site for science writers.

In addition to writing releases, GSA Communications encourages others to do so. In advance of all meetings, for example, we send copies of abstracts to the public information officers of each presenter's home institution. We give them details about the meeting, encourage them to write releases publicizing the science, and offer assistance in distributing their releases.

Do we encourage media to attend our meetings?

Absolutely. Media advisories about upcoming meetings are issued months in advance so journalists can put GSA on their calendars and in their budgets. At the annual meeting and at selected specialty meetings, GSA operates an onsite newsroom. Qualified journalists are given complimentary registration, access to an efficient, comfortable place to work between sessions, and other forms of support and assistance. Local and regional media are also invited to attend Section meetings, although cost prevents us from operating onsite newsrooms.

Does anything get covered beyond "dinos and disasters?"

You'd be surprised. There is considerable interest in science; we just need to do a good job of telling the story. At last year's annual meeting, for instance, presentations receiving coverage spanned the following categories:

Earth system processes	Impact events
Environmental geoscience	Paleoceanography
Geoarchaeology	Paleoclimatology
Geobiology	Paleontology
Geochemistry	Planetary science
Glaciology	Sedimentology
Hazards	Structure/tectonics
Hydrogeology	Technology

Are we accomplishing anything of value beyond simple "infotainment?"

One of the great things about media work is that it helps scientists reach other scientists. Research published by GSA or presented at meetings is regularly reported in *Science* and *Nature*. We've had coverage in *The Biochemist*, *BioMedNet*, and *Trends in Analytical Chemistry*. The fact that editors of *Physics Today* and *Archaeology Today* have asked to be added to our distribution list is also evidence that we've raised awareness of geoscience in the broader scientific community. In addition, media work directly supports K–16 educators. We've received article requests from teachers in the geosciences, biological sciences, and history. Lastly, the entire scientific community and society at large benefit from having better informed public policy makers.

How can I become more media savvy?

Sign up for a media relations workshop. The next one will take place at the 2004 GSA Annual Meeting in Denver. In the meantime, here are some ways to increase your skill and comfort levels in speaking with journalists.

Become More Media Savvy

With GSA's annual meeting only a month away, this is a good time to think about how to work more effectively with the media. When preparing to speak with a science writer or other journalist, consider the following:

- What's the significance of the research? Create a context for your work that's capable of engaging the non-technical, science-reading general public.
- What's most interesting about the research? This is also known as the Big Wow. Keep in mind that this is often different for the general public than for fellow scientists.
- What's a possible angle that a writer could pursue? Make it easy for journalists to quickly envision a good story.
- Speak in non-technical language to the greatest extent possible. Be concise. One idea per sentence is a good rule of thumb.
- Don't overwhelm. Hit the high points and let the writer ask for more detail when he or she wants or is ready for it. As someone once observed, "It's possible to make a pretty good omelet without understanding how a chicken works."

NORTH-CENTRAL

38th Annual Meeting
North-Central Section, GSA
St. Louis, Missouri

April 1–2, 2004

The 38th Annual Meeting of the North-Central Section of the Geological Society of America will be hosted by the Department of Earth and Atmospheric Sciences of Saint Louis University. The meeting will be held at the Millennium Hotel St. Louis, located across from the Gateway Arch and Busch Stadium and only minutes from the Laclede's Landing entertainment district.

CALL FOR PAPERS

Abstract deadline: January 6, 2004

Papers are invited for theme and general discipline sessions in both oral and poster format. Volunteered papers will be considered for any general discipline session as listed on the GSA abstracts form. Authors interested in volunteering papers for symposia should contact the appropriate symposium conveners before submitting their abstract. An individual may present only one volunteered paper; however, a person may be a co-author on other papers. Those invited for symposia may also present additional papers. For further information, please contact Technical Program Chair Tim Kusky at kusky@eas.slu.edu. Abstracts of papers must be submitted using the electronic submissions form at the GSA Web site, www.geosociety.org. If you have questions regarding abstract submission, please contact Nancy Carlson, ncarlson@geosociety.org.

TECHNICAL PROGRAM

The following symposia and theme sessions are planned for the St. Louis meeting. Anyone interested in proposing additional symposia or theme sessions should contact Technical Program Chair Tim Kusky, Saint Louis University, kusky@eas.slu.edu.

SYMPOSIA

1. **Urban Geology.** Joachim Dorsch, dorsch@eas.slu.edu; Mimi Garstang, nrgarsm@mail.dnr.state.mo.us.
2. **Carbonate-Hosted Ore Mineralization and Genesis.** Kevin L. Shelton, SheltonKL@missouri.edu; Jay M. Gregg, greggjay@umr.edu.
3. **New Madrid Zone: Seismicity, Tectonics, Paleoseismology, and Tectonic Geomorphology.** Buddy Schweig, schweig@usgs.gov; John Holbrook,

jholbrook@semovm.semo.edu; David Kirschner, dkirschn@eas.slu.edu.

THEME SESSIONS

1. **Recent Developments in Understanding Carbonate Geology of the Midcontinent.** Gene Rankey, grankey@rsmas.miami.edu; Zak Lasemi, lasemi@isgs.uiuc.edu.
2. **Hydrogeologic Modeling and Heterogeneity—Addressing the Complexities of the Sediment Record.** Don Keefer, keefer@isgs.uiuc.edu.
3. **Extending Geoscience Education, K–16 and Beyond.** *Sponsored by the Central Section of the National Association of Geoscience Teachers.* Russanne Low, rflow@cce.umn.edu; Kerry L. Keen, kerry.l.keen@uwrf.edu.
4. **New Understandings of the Geology and Hydrology of Buried Valleys.** Skip Nelson, rsnelso@ilstu.edu; Tim Larson, tlarson@isgs.uiuc.edu.
5. **Recent Research in Economic Geology: From Missouri to the World.** Richard D. Hagni, rhagni@umr.edu; Cheryl M. Seeger, nrseegc@mail.dnr.state.mo.us.
6. **Undergraduate Research in the Geosciences (Poster Session).** *Sponsored by the Council on Undergraduate Research.* Robert Shuster, rshuster@mail.unomaha.edu; Dave Matty, david.j.matty@cmich.edu.

GENERAL DISCIPLINE SESSIONS

General Discipline Sessions for both oral presentations and posters will be organized to accommodate volunteered papers. These General Discipline Sessions are in addition to Symposia (invited papers and selected volunteered papers) and Theme Sessions (volunteered papers).

FIELD TRIPS

Details about field trips will be available in the December 2003 issue of *GSA Today* and at www.geosociety.org/sectdiv/northc/04ncmtg.htm. You may also contact Field Trip Coordinator David Kirschner, Saint Louis University, dkirschn@eas.slu.edu, or the individual field trip leaders.

1. **Urban Expansion Hazards.** Bill Duley, nrduleb@mail.dnr.state.mo.us.
2. **Architecture and Heterogeneity of Middle Mississippian Grainstones, Eastern Missouri.** Gene Rankey, grankey@rsmas.miami.edu.
3. **Late Upper Cambrian Syndepositional Tectonics, St. Francois Mountains, Missouri.** Cheryl Seeger, nrseegc@mail.dnr.state.mo.us.
4. **Economic Geology of Southeast Missouri.** Kevin L. Shelton, SheltonKL@missouri.edu; Jay M. Gregg, greggjay@umr.edu; Richard D. Hagni, rhagni@umr.edu.
5. **Event Stratigraphy and Mineral Resources of the Silurian Rocks of West-central Illinois and North-eastern Missouri.** Don Mikulic, mikulic@geoserv.isgs.uiuc.edu.
6. **Neotectonics of the New Madrid Seismic Zone.** Leaders to be announced.

7. **An Overview of Geology and Karst Development along the I-44 Corridor between St. Louis and St. James, Missouri.** Jim Vandike, nrvandj@mail.dnr.state.mo.us.

WORKSHOPS

1. **Roy J. Shlemon Mentor Program in Applied Geoscience.** *Sponsored by the GSA Foundation.* Thurs.–Fri., April 1–2, 11:30 a.m.–1 p.m., location to be announced. Karlon Blythe, kblythe@geosociety.org. This interactive and informative program for undergraduate and graduate students, led by professional geoscientists, will cover real-life issues including professional opportunities and challenges that await students after graduation. Plan to attend both free luncheons to hear different presenters each day. Students will receive **FREE LUNCH** tickets in their registration packet to attend both Shlemon Programs. However, space is limited. First come, first served.
2. **Woolly Mammoth Comes Alive for K–12 Educators.** Sat., April 3. Janis Treworgy, jdt@prin.edu; William Slattery, William.Slattery@wright.edu. A workshop for K–12 teachers to support teaching about Ice Age mammals will be held on the Principia College campus, where a woolly mammoth is being excavated. Contact Janis Treworgy directly to register.

STUDENT TRAVEL SUPPORT

Application deadline: February 2, 2004

The North-Central Section of GSA, in cooperation with the GSA Foundation, will provide grants for travel assistance of up to \$200 (exclusive of field trip fees) to student members and associates of GSA. Assistance will be offered on a first-come, first-served basis with priority given to students presenting papers (oral presentation or poster). Send application to General Meeting Chair Joachim Dorsch, Saint Louis University, dorsch@eas.slu.edu. Application forms and mailing address are available at <http://csd.unl.edu/ncgsa/current-forms/student-forms/htm>.

STUDENT AWARDS

The North-Central Section of GSA will present cash awards for best and honorable-mention student papers (both oral and poster). To be eligible, students (undergraduate and graduate) must be lead authors and presenters and should indicate their student status on the submission form.

EXHIBITS

Exhibits will be located in the Millennium Hotel St. Louis. For information on exhibit rates and space reservations, contact Exhibits Coordinator David Kirschner, Saint Louis University, dkirschn@eas.slu.edu.

REGISTRATION

Preregistration deadline: February 23, 2004

Cancellation deadline: March 1, 2004

GSA Headquarters will handle preregistration. Registration details will be published in the December 2003 issue of *GSA Today* and will be available at www.geosociety.org beginning in the first part of December 2003. On-site registration will be possible at the Millennium Hotel St. Louis at the time of the meeting.

ACCOMMODATIONS

A block of rooms has been reserved at the Millennium Hotel St. Louis (200 South 4th Street, St. Louis, Missouri 63102), which is also the site for the scientific sessions and business meetings. Detailed information, including special GSA rates, will be provided in the December 2003 issue of *GSA Today* and is available at www.geosociety.org/sectdiv/northc/04ncmtg.htm and at www.eas.slu.edu/ncgsa/index.html.

SOCIAL ACTIVITIES

Information on the spouse and guest program, special events, and the business meeting schedule will be included in the December 2003 issue of *GSA Today* and at www.geosociety.org/sectdiv/northc/04ncmtg.

ACCESSIBILITY

GSA is committed to ensuring full participation for conference attendees with disabilities (e.g., physical, hearing, visual) at all events at the 2004 meeting. Every attempt is made for full compliance with the Americans with Disability Act. You may indicate special requirements on your registration form, and you should inform the local organizing committee of these requirements at least one month prior to the meeting. If you require an accessible room, inform the hotel of your needs when making your reservation.

DETAILED INFORMATION

For more information, please contact General Meeting Chair Joachim O. Dorsch, dorsch@eas.slu.edu.



*Let us leverage
your support of women
in the geosciences!*

**“to achieve equality of opportunity
in the geosciences for women”**

<http://www.awg.org/AWGFoundation/>

A 501(c)3 non-profit public education corporation

ANALYTICAL SERVICES FOR GEOLOGISTS
Innovative MWI analysis for effective overburden penetration

PLUS:

- Fire Assay
- ICP/ICP-MS
- Whole Rock Analysis
- Neutron Activation
- Sample prep & forwarding through SGS offices worldwide

SGS Minerals Services
1885 Leslie St., Toronto, ON
Canada M3B 3J4
Tel: (416) 445-5755
Fax: (416) 445-4152
1-800-387-0255
xral@sgs.com
www.sgs.ca/xral

 **SGS**
WHEN YOU NEED TO BE SURE

Call for GSA Committee Service

Stimulate Growth and Change! Serve on a GSA Committee

GSA is seeking candidates to serve on Society committees and as GSA representatives to other organizations. Contribute to our science by volunteering yourself or nominating others you think should be considered for any of the following openings. Younger members are especially encouraged to become involved in Society activities. If you volunteer or make recommendations, please give serious consideration to the specified qualifications for serving on a particular committee. **Please be sure that your candidates are GSA Members or Fellows and that they fully meet the requested qualifications.**

The nomination form and instructions are available at www.geosociety.org/aboutus/commtees. Upon accessing the site, click on the **2004–2005 Nomination Form** link to access the form. For questions pertaining to nominations, please contact Ruth Harrison at (303) 357-1000, ext. 0, 1-800-472-1988, or rharrison@geosociety.org.

Nominations received at GSA headquarters by **February 1, 2004**, on the official one-page form will be forwarded to the Committee on Nominations. *GSA Council requires that the form be complete.* Information requested on the form will assist the committee members with their recommendations for the July 2004 committee vacancies. Please use one form per candidate. If additional space is needed, you may attach a separate page. The committee will present at least two nominations for each open position to the Council at its May meeting. Appointees will then be contacted and asked to serve, thus completing the process of bringing new expertise into Society affairs.

Graduate Students: You are eligible to serve on GSA committees as full members, and Council encourages you to volunteer or nominate others for committee service.

Terms begin July 1, 2004

July 2004 Committee Vacancies

Arthur L. Day Medal Award (T/E) 2 member-at-large vacancies

Selects candidates for the Arthur L. Day Medal Award. **Qualifications:** knowledge of those who have made “distinct contributions to geologic knowledge through the application of physics and chemistry to the solution of geologic problems.”

Education (AM, B/E) 2 vacancies: 1 member-at-large; 1 undergraduate-level educator

Stimulates interest in the importance and acquisition of basic knowledge in the earth sciences at all levels of education and promotes the importance of earth-science education to the general public. **Qualifications:** ability to work with other interested scientific organizations and science teachers' groups to develop precollege earth science education objectives and initiatives.

Geology and Public Policy (AM, B/E, T/E)

1 member-at-large vacancy

Translates knowledge of earth sciences into forms most useful for public discussion and decision making. **Qualifications:** experience in public policy issues involving the science of geology; ability to develop, disseminate, and translate information from the geologic sciences into useful forms for the general public and for GSA members; familiarity with appropriate techniques for the dissemination of information.

Honorary Fellows (T/E)

2 member-at-large vacancies

Selects candidates for Honorary Fellows, usually non-North Americans. **Qualifications:** knowledge of geologists throughout the world who have distinguished themselves through their contributions to the science.

Joint Technical Program Committee (B/E, T/E)

1 Marine Geology representative

Assists in finalizing the technical program of the Annual Meeting: reviews abstracts or provides names of reviewers to evaluate abstracts, participates in the Web-based activities in the selection and scheduling of abstracts, participates in topical session proposal review.

Qualifications: should be a specialist in computers and marine geology, and must be able to attend a meeting in late summer.

Membership (B/E)

1 student representative; 3 member-at-large vacancies (require members from the following employment categories: academia, government, and industry)

Evaluates membership benefits and nominees for Fellowship; develops recommendations that address the changing needs of the membership and attract new members. **Qualifications:** experience in benefit, recruitment, and retention programs is desired.

Minorities and Women in the Geosciences (AM)

3 member-at-large vacancies

Stimulates recruitment and promotes positive career development of minorities and women in the geoscience professions. **Qualifications:** familiarity with minority and female education and employment issues; expertise and leadership experience in such areas as human resources and education.

Nominations (B/E)

2 member-at-large vacancies

Recommends to the Council nominees for the positions of GSA Officers and Councilors, Committee members, and Society representatives to other permanent groups. **Qualifications:** familiarity with a broad range of well-known and highly respected geological scientists.

KEY * Extensive time commitment required; AM—Meets at Annual Meeting; B/E—Meets in Boulder or elsewhere; T/E—Communicates by phone or electronically

Penrose Conferences and Field Forums (T/E)

2 member-at-large vacancies

Reviews and approves Penrose Conference proposals and recommends and implements guidelines for the success of the conferences. **Qualifications:** past convener of a Penrose Conference or a Field Forum.

Penrose Medal Award (T/E)

2 member-at-large vacancies

Selects candidates for the Penrose Medal Award. Emphasis is placed on "eminent research in pure geology, which marks a major advance in the science of geology." **Qualifications:** familiarity with outstanding achievements in the geological community that are worthy of consideration for the honor.

Publications (AM, B/E, T/E)

1 member-at-large vacancy

Nominates candidates for editors' positions; approves of editorial boards; reviews the quality and health of Society publications; explores the initiation of new ventures, including electronic publishing, as well as cessation of existing publications. **Qualifications:** extensive publications experience.

Research Grants* (B/E)

7 member-at-large vacancies

Evaluates research grant applications and selects grant recipients.

Qualifications: should have experience in directing research projects and in evaluating research grant applications.

Treatise on Invertebrate Paleontology Advisory Committee (AM)

2 member-at-large vacancies (paleontologists)

Advises the Council, Committee on Publications and the *Treatise* editor in matters of policy concerning this publication. **Qualifications:** must be a paleontologist.

Young Scientist Award (Donath Medal) (T/E)

2 member-at-large vacancies

Committee members investigate the achievements of young scientists who should be considered for this award and submit recommendations to Council.

Qualifications: should have knowledge of young scientists with "outstanding achievement(s) in contributing to geologic knowledge through original research which marks a major advance in the earth sciences."

Representative to the North American Commission on Stratigraphic Nomenclature

1 vacancy

Must be familiar with and have expertise in stratigraphic nomenclature.

Committee, Section, and Division Volunteers: Council Thanks You!

The GSA Council acknowledges the many member-volunteers who, over the years, have contributed to the Society and to our science through involvement in the affairs of the GSA.

Each year, GSA asks for volunteers to serve on committees, and many highly qualified candidates express their willingness to serve. Not everyone can be appointed to the limited number of vacancies; however, members are reminded that there are also opportunities to serve in the activities and initiatives of the sections and divisions. Annually, the Council asks sections and divisions to convey the names of potential candidates for committee service to the Committee on Nominations.

Lane

GEOLOGY & PALEONTOLOGY SPECIMEN CABINETS



For over forty years, Lane Science Equipment has been the name museums, universities and individual collectors trust most to protect their valuable specimens.

To learn more about our Geology & Paleontology Cabinets or any of our other products, visit our website at www.lanescience.com or contact us at the listing below.

- * All steel construction
- * No adhesives
- * Lane lift-off door
- * Powder paint finish
- * Durable neoprene door seal
- * Reinforced for easy stacking

LANE SCIENCE EQUIPMENT CORP.

225 West 34th Street
Suite 1412
New York, NY 10122-1496

Tel: 212-563-0663
Fax: 212-465-9440
www.lanescience.com

NEW TITLES FROM ELSEVIER

INCLUDING ACADEMIC PRESS

Visit us at
GSA
Booth #502



TREATISE ON GEOCHEMISTRY

Ten-Volume Set

Editors in Chief: Heinrich D. Holland & Karl K. Turekian

The *Treatise on Geochemistry* presents a comprehensive, integrated summary of the present state of the field. It includes 165 chapters from more than 250 authors.

November 2003, 10-Volume set, Hardbound, c.5,300 pp., ISBN 0-08-043751-6

Introductory Offer (valid until three months after publication): US \$3,675 / EUR 3,860

(Regular Price will be US \$4,595 / EUR 4,825) • www.TreatiseOnGeochemistry.com • Elsevier imprint

ENCYCLOPEDIA OF GEOLOGY

Five-Volume Set

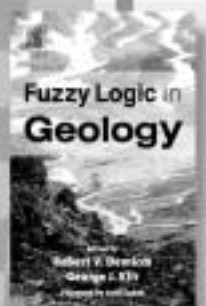
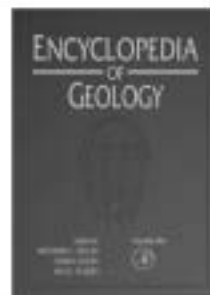
Editor-in-Chief: Richard C. Selley

Editors: Robin Cocks and Ian R. Plimer

This unrivalled, five-volume reference work covers all aspects of geology including earth history, earth materials, surface processes, regional geology, economic geology, engineering geology, environmental geology, petroleum geology, geochemical and mineral exploration, and the history of geology.

November 2004, 5-Volume Set, Hardbound, c. 2,750 pp., ISBN: 0-12-636380-3

www.EncyclopediaofGeology.com • Elsevier imprint



FUZZY LOGIC IN GEOLOGY

Edited by Robert V. Demicco & George J. Klir

Fuzzy logic explores modes of reasoning that are approximate rather than exact. This book is the first to introduce the use of fuzzy set theory in a style that geoscientists can understand, and reviews specific areas where it can be applied. The Foreword is written by the inventor of fuzzy logic, Lotfi Zadeh.

September 2003, Hardbound, 350 pp., ISBN: 0-12-415146-9, US \$95.00 / £ 59.95 • Academic Press imprint

ENVIRONMENTAL MAGNETISM: Principles and Applications of Enviromagnetics

Michael E. Evans & Fredrich Heller

This book details the occurrence and uses of magnetic materials in the natural environment and is broadly applicable to the environmental sciences. It demonstrates that magnetic materials are universal and can provide a natural archive of conditions existing in a former time.

April 2003, Hardbound, 299 pp., ISBN: 0-12-243851-5, US \$69.95 / £45.00 • Academic Press imprint



INTERNATIONAL HANDBOOK OF EARTHQUAKE AND ENGINEERING SEISMOLOGY, Parts A & B

Edited by William H. K. Lee, Hiroo Kanamori, Paul C. Jennings, and Carl Kisslinger

"Monumental in scope, authoritative in treatment, and history in impact... will be the most important source book for seismology and its applications for years to come..."

— Frank Press, President Emeritus, US National Academy of Sciences

A complete resource library, developed by the Committee on Education of IASPEI in collaboration with IAEE. Features nearly 100 original chapters, 1,000 tables and illustrations, color plates, full glossary, seismic software, databases, and other electronic elements.

Part A: 2002, Hardbound w/CD-ROM, 932 pp., ISBN: 0-12-440652-1 • US \$150.00 / £99.95

Part B: June 2003, Hardbound w/2 CD-ROMs, 1040 pp., ISBN: 0-12-440658-0 • US \$150.00 / £99.95

<http://books.elsevier.com/quake> • Academic Press imprint

Order from your favorite bookseller, or directly from Elsevier:

For Academic Press imprint titles:

In US and Canada:

Phone: 1-800-545-2522

In the UK and other countries:

Phone: +44 (0) 01865 474000

<http://books.elsevier.com/earthscience>

For Elsevier imprint titles:

In US and Canada:

Phone: 1-888-437-4636

In Europe and other countries:

Phone: (+31) 20-485-3757

<http://earth.elsevier.com>



Academic Press is an imprint of Elsevier. Prices are in U.S. dollars and subject to change.

GSA AWARDS & MEDALS

Penrose Medal

The Penrose Medal was established in 1927 by R.A.F. Penrose Jr. to be awarded in recognition of eminent research in pure geology, for outstanding original contributions, or for achievements that mark a major advance in the science of geology. The award is made only at the discretion of the GSA Council. Nominees are selected by the Council and may or may not be members of the Society. Penrose's sole objective in making the gift was to encourage original work in purely scientific geology, which is interpreted as applying to all scientific disciplines represented by the Society. Scientific achievements should be considered rather than contributions in teaching, administration, or service. Mid-career scientists who have already made exceptional contributions should be given full consideration for the award.

Day Medal

The Day Medal was established in 1948 by Arthur L. Day to be awarded annually, or less frequently, at the discretion of the Council, for outstanding distinction in contributing to geologic knowledge through the application of physics and chemistry to the solution of geologic problems. Day's intent was to recognize outstanding achievement and inspire further effort, rather than reward a distinguished career. Scientific achievements should be considered rather than contributions in teaching, administration, or service.

Honorary Fellows

Each year, this honor is bestowed on non-North Americans who live and work outside of North America and have distinguished them-

selves in geological investigations or in notable service to the Society. Under exceptional circumstances, North Americans have been named Honorary Fellows. This amendment to the bylaws was made in 1969 when the Apollo II astronauts who first walked on the Moon were elected.

The GSA Council established the program in 1909, and since then, except during a few war years, one or more Honorary Fellows have been elected annually. Most Honorary Fellows have been elected after many years of outstanding and internationally recognized contributions to the science. At present, there are 61 living geologists who have received this honor.

The GSA Council encourages the membership to submit names of qualified candidates for this honor. In preparing a nomination, it is imperative that the original research and scientific advances of the candidate be stressed. The nominator should also verify all supporting data, especially degrees received, publications, and positions held.

How to Nominate (Penrose, Day, Honorary Fellows)

To ensure thorough consideration by the respective committees, please submit a brief biographical sketch for each candidate, such as that used in *American Men and Women of Science* and *Who's Who in America*, a summary (200 words or less) of the candidate's scientific contributions to geology that qualify the individual for the award, and a selected bibliography of no more than 20 titles.

A nomination for any one of these three awards *must be supported* by signed letters from each of five (5) GSA Fellows or Members in addition to the person making the nomination. The letters may be attached to the nomination form or may be sent to GSA separately. For Honorary Fellow nominations, please verify degrees received, publications, and positions held. The names of unsuccessful candidates proposed to the Council by the respective committees will remain for consideration by those committees for three years. For those still under consideration, it is recommended that an updated letter of renomination be sent to GSA.

The nomination form and instructions are available on the GSA Web site, www.geosociety.org, under Grants, Awards & Medals.

A nomination form may also be obtained from the Program Officer, Grants, Awards, and Medals, (303) 357-1028, awards@geosociety.org. **The deadline for receipt of nominations is February 1, 2004.**

Young Scientist Award (Donath Medal)

The Young Scientist Award was established in 1988 to be awarded to a young scientist (35 or younger during the year in which the award is to be presented) for outstanding achievement in contributing to geologic knowledge through original research that marks a major advance in the earth sciences. The award, consisting of a gold medal called the Donath Medal and a cash prize of \$20,000, was endowed by Dr. and Mrs. Fred A. Donath.

For the year 2004, only those candidates born on or after January 1, 1969, are eligible for consideration. In choosing candidates for the Young Scientist Award, scientific achievement and age will be the sole criteria. Nominations for the 2004 award must include:

- biographical information;
- a summary of the candidate's scientific contributions to geology (200 words or less);
- a selected bibliography (no more than 10 titles); and
- supporting letters from five scientists in addition to one from the person making the nomination.

The nomination form and instructions are available at www.geosociety.org under Grants, Awards & Medals. A nomination form may also be obtained from the Program Officer, Grants, Awards, and Medals, (303) 357-1028, awards@geosociety.org. **The deadline for receipt of nominations is February 1, 2004.**

GSA Distinguished Service Award

Council established the GSA Distinguished Service Award in 1988 to recognize individuals for their exceptional service to the Society. GSA Members, Fellows, and Associates may be nominated for consideration. Any GSA member or employee may make a nomination for the award. The Executive Committee will select awardees, and the Council must ratify all selections. Awards may be made annually, or less frequently, at the discretion of Council. This award will be presented during the Annual Meeting of the Society. A letter of nomination, a brief biographical sketch, and a summary (200 words or less) of the candidate's contributions to the Society that qualify the individual for the award should be addressed to Program Officer, Grants, Awards, and Medals, GSA, P.O. Box 9140, Boulder, CO 80301-9140, or visit www.geosociety.org under Grants, Awards & Medals for more information and for a nomination form. **Deadline for nominations is February 1, 2004.**

(continued on p. 50)

GSA AWARDS & MEDALS

GSA Public Service Award

Council established the GSA Public Service Award in honor of Eugene and Carolyn Shoemaker in 1998 to be awarded for contributions that have materially enhanced the public's understanding of the earth sciences or significantly served decision makers in the application of scientific and technical information in public affairs and public policy related to the earth sciences. This may be accomplished by individual achievement through:

- Authorship of educational materials of high scientific quality that have enjoyed widespread use and acclaim among educators or the general public;
- Acclaimed presentations (books and other publications, mass and electronic media, or public presentations, including lectures) that have expanded public awareness of the earth sciences;
- Authorship of technical publications that have significantly advanced scientific concepts or techniques applicable to the resolution of earth-resource or environmental issues of public concern; or,
- Other individual accomplishments that have advanced the earth sciences in the public interest.

The award will normally go to a GSA member, with exceptions as approved by Council. It may be presented posthumously to a descendant of the awardee.

Nominations must include a cover letter and biographical information that clearly demonstrates applicability to the selection criteria. A letter of nomination, a brief biographical sketch, a summary (200 words or less) of the candidate's contributions that qualify the individual for the award, and a selected bibliography of no more than 10 titles should be addressed to Program Officer, Grants, Awards, and Medals, GSA, P.O. Box 9140, Boulder, CO 80301-9140. Visit www.geosociety.org under Grants, Awards & Medals for more information or for a nomination form. **The deadline for receipt of nominations is February 1, 2004.**

2004 John C. Frye Environmental Geology Award

In cooperation with the Association of American State Geologists (AASG), GSA makes an annual award for the best paper on environmental geology published either by GSA or by one of the state geological surveys. The award is a \$1,000 cash prize from the endowment income of the GSA Foundation's John C. Frye Memorial Fund.

Criteria for Nomination

Nominations can be made by anyone on the basis of the following criteria: (1) paper must be selected from GSA or state geological survey publications, (2) paper must be selected from those published during the preceding three full calendar years, (3) nomination must include a paragraph stating the pertinence of the paper, and (4) nominations must be sent to Program Officer, Grants, Awards, and Medals, GSA, P.O. Box 9140, Boulder, CO 80301-9140. **Deadline: March 31, 2004.**

Basis for Selection

Each nominated paper will be judged on its uniqueness or significance as a model of its type of work and report and overall worthiness for the award. In addition, nominated papers must establish an environmental problem or need, provide substantive information on the basic geology or geologic process pertinent to the problem, relate the geology to the problem or need, suggest solutions or provide appropriate land use recommendations based on the geology, present the information in a manner that is understandable and directly usable by geologists, and address the environmental need or resolve the problem. It is preferred that the paper be directly applicable by informed laypersons (e.g., planners, engineers).

2003 Award Recipient Named

The 2003 award will be presented at the GSA Annual Meeting in Seattle, Washington, to Ronald K. Churchill, Chris T. Higgins, and Bob Hill for "Areas more likely to contain Natural Occurrences of Asbestos in Western El Dorado County, California," published by the California Department of Conservation, 2000.

2004 Doris M. Curtis Memorial Fund for WOMEN IN SCIENCE AWARD

In partnership with Subaru of America, GSA is proud to once again announce the Doris M. Curtis Memorial Fund for Women in Science Award.

This award is named in honor of a pioneer in the field, Doris Curtis. Doris Curtis was GSA's 103rd president. Her popularity was widespread, and she opened many new directions for geology, not the least of which was her tenure as GSA president after an unbroken chain of 102 men. Causes dear to Doris were women, public awareness, minorities, and education.

The Women in Science Award will be awarded to a woman or women who have impacted the field of the geosciences in a major way based on their Ph.D. research. Women are eligible for the first 3 years following their degree. The 2004 award will be \$2,500 and it will be presented at the 2004 Denver Annual Meeting.

GSA seeks nominations for the Doris M. Curtis Memorial Fund for Women in Science Award for 2004. Nominations must include a nominating letter that clearly states how the Ph.D. research has impacted geosciences

in a major way, a short summary of the research, a short resume with a list of publications and a copy of the dissertation abstract, published abstracts, and/or reprints as available. Please contact awards@geosociety.org for additional information.

Please send nominations and supporting material to: Program Officer, Grants, Awards, and Medals, GSA, P.O. Box 9140, Boulder, CO 80301-9140. **The deadline for receipt of nominations is February 1, 2004.**

Sponsored by Subaru of America, Inc.



National Awards for 2006

Deadline: April 30, 2004

Those who wish to make nominations for the following national awards should send background information, vitae, and the name of the award for which the candidate is being nominated to Program Officer, Grants, Awards, and Medals, GSA, P.O. Box 9140, Boulder, CO 80301-9140, (303) 357-1028, fax 303-357-1070. On behalf of its member societies, The American Geological Institute (AGI) coordinates the nomination process with the respective offices sponsoring these awards. The AGI Member Society Council will finalize a roster of candidates at its spring 2004 meeting.

The William T. Pecora Award, sponsored jointly by NASA and the Department of the Interior, is presented annually in recognition of outstanding contributions of individuals or groups toward the understanding of Earth by means of remote sensing. The award recognizes contributions by those in the scientific and technical community as well as those involved in the practical application of remote sensing. Consideration will be given to sustained or single contributions of major importance to the art or science of understanding Earth through observations made from space.

The president of the United States awards the National Medal of Science to individuals "deserving of special recognition by reason of their outstanding contributions to knowledge in the physical, biological, mathematical, engineering, or social and behavioral sciences." The committee is giving increasing attention to the many younger

American scientists and engineers who may be reaching a point where their contributions are worthy of recognition, as well as to those outstanding women and minority scientists who deserve recognition.

The Vannevar Bush Award is presented from time to time to a person who, through public service activities in science and technology, has made an outstanding contribution toward the welfare of mankind and the nation. The award is given to a senior statesman of science and technology and complements the National Science Foundation's Alan T. Waterman Award. The two awards are designed to encourage individuals to seek the highest levels of achievement in science, engineering, and service to humanity. The nomination should be accompanied by a complete biography and a brief citation summarizing the nominee's scientific or technological contributions to our national welfare in promotion of the progress of science.

The Alan T. Waterman Award is presented annually by the National Science Foundation (NSF) and National Science Board to an outstanding young researcher in any field of science or engineering supported by NSF. Candidates must be U.S. citizens or permanent residents and must be 35 years of age or younger OR not more than five years beyond receipt of the Ph.D. degree by December 31 of the year in which they are nominated. Candidates should have completed sufficient scientific or engineering research to have demonstrated, through personal accomplishments, outstanding capability and exceptional promise for significant future achievement.

Photo: Ken Hamblin

The logo for EPIC (Earth Photo Image Catalog) is displayed in a stylized, serif font with a registered trademark symbol. It is positioned in the upper right corner of a black and white photograph of a mountain range.

EPIC — first international archive of geologic photos

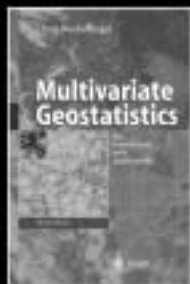
Available Nov. 1!! Thousands of outstanding **geologic photos** and **satellite images** from the classic collections of:

✓ John Shelton ✓ Ken Hamblin ✓ Austin Post ✓ Dave Rahm
✓ Lee Mann ✓ Don Easterbrook ✓ John Dohrenwend ✓ Dave Evans

Plus color **Landsat satellite images** of geologic features

Available for viewing and purchase on-line at <http://geosociety.org> and in the exhibits center (Booth 1102), Seattle GSA Meeting Nov. 1-4, 2003. dbunny@cc.wvu.edu

New from Springer



New Edition

Multivariate Geostatistics An Introduction with Applications Third Edition

H. WACKERNAGEL, *Center for Geostatistics, Fontainebleau, France*

Some praise for previous editions:

"... This book is an insightful introduction to linear geostatistics in general and multivariate geostatistics in particular, and provides a springboard to further study and research in this very interesting area."
—METRIKA

"... Explanations are intuitive, with graphical interpretations included where possible. Additionally, mathematical relationships are explained with uncommon clarity."
—JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION

This book presents an introduction to geostatistics stressing the multivariate aspects for scientists, engineers or statisticians. Geostatistics offers a variety of models, methods and techniques for the analysis, estimation and display of multivariate data distributed in space or time. This book presents a brief review of statistical concepts, a detailed introduction to linear geostatistics, and an account of 3 basic methods of multivariate analysis. Applications from very different areas of science, as well as exercises with solutions, are provided to help convey the general ideas. In the second edition, the introductory chapter has been divided into two separate chapters for clarity. Furthermore, the chapters regarding ordinary kriging and cokriging have been restructured and the section on non-stationary geostatistics has been entirely rewritten.

2003/387 PP., 117 ILLUS./HARDCOVER/\$69.95/ISBN 3-540-44142-5

Plurigaussian Simulations in Geosciences

M. ARMSTRONG, *Center for Industrial Economics, Fontainebleau, France, et al.*

Plurigaussian Simulations in Geosciences presents the theory required to understand the method, along with the practical examples of applications in mining and the oil industry as well as tutorial examples. An accompanying CD-ROM featuring demonstration software and color images complement the written text.

2003/149 PP., 77 ILLUS./HARDCOVER WITH CD-ROM/\$69.95/ISBN 3-540-42390-7

Waves in the Ocean and Atmosphere

Introduction to Wave Dynamics

J. PEDLOSKY, *Woods Hole Oceanographic Institution, Woods Hole, MA*

Starting with an elementary overview of the basic wave concept, specific wave phenomena are examined, including: surface gravity waves, internal gravity waves, lee waves, waves in the presence of rotation, geostrophic adjustment, quasi-geostrophic waves and potential vorticity, wave-mean flow interaction and unstable waves. Each wave topic is used to introduce either a new technique or concept in general wave theory. Emphasis is placed on connectivity between the various subjects and on the physical interpretation of the mathematical results. The book contains numerous exercises at the end of the respective chapters.

2003/260 PP., 98 ILLUS./HARDCOVER/\$49.95
ISBN 3-540-00340-1

Dynamics of Multiscale Earth Systems

H.J. NEUGEBAUER and C. SIMMER, both,
University of Bonn, Germany (eds.)

2003/368 PP., 85 ILLUS./SOFTCOVER/\$89.95
ISBN 3-540-41796-6

LECTURE NOTES IN EARTH SCIENCES, VOL. 97

Phase Diagrams for Geoscientists

An Atlas of the Earth's Interior

T. GASPARIK, *State University of New York,
Stony Brook, NY*

This book summarizes the author's experimental studies of phase relations in the chemical systems relevant to earth, carried out over 20 years using piston-cylinder and multi-anvil presses. A summary of the research at high pressures and temperatures carried out by many other experimental petrologists is also included. The data was used to develop an internally consistent thermodynamic model, which was then used to calculate phase diagrams. This produced the largest collection of the calculated phase diagrams published to date and the first to encompass temperature and pressure ranges corresponding to the whole upper mantle.

2003/462 PP., 324 ILLUS./HARDCOVER/\$169.00
ISBN 3-540-00248-0

Integrated Land Use and Environmental Models

A Survey of Current Applications and Research

S. GUHATHAKURTA, *Arizona State University,
Tempe, AZ (ed.)*

2003/271 PP., 96 ILLUS./HARDCOVER/\$119.00
ISBN 3-540-00576-5

Water Resources of North America

A.K. BISWAS, *Center for Water Management,
Mexico City, Mexico (ed.)*

The authors describe the status of water resource use and water quality in the US, Canada, and Mexico at the start of the third millennium. The book summarizes future water use and supply projections, plus the primary challenges currently facing water resource managers.

2003/381 PP., 107 ILLUS./HARDCOVER/\$125.00
ISBN 3-540-00284-7

Waves and Tidal Flat Ecosystems

E. BABA, *University of Hiroshima, Japan, et al.*

2003/164 PP., 144 ILLUS. (27 IN COLOR)
HARDCOVER/\$109.00/ISBN 3-540-00442-4

Ocean Biogeochemistry The Role of the Ocean Carbon Cycle in Global Change

M. FASHAM, *Southampton Oceanography
Centre, Southampton, UK*

2003/297 PP., 130 ILLUS./HARDCOVER/\$119.00
ISBN 3-540-42398-2

GLOBAL CHANGE - THE IGBP SERIES

Security and Environment in the Mediterranean Conceptualising Security and Environmental Conflicts

H.G. BRAUCH, *Free University of Berlin,
Germany, et al. (eds.)*

2003/1,182 PP., 321 ILLUS./HARDCOVER/\$159.00
ISBN 3-540-40107-5

Optical Properties and Remote Sensing of Multicomponental Water Bodies

H. ARST, *Marine Systems Institute, Tallinn,
Estonia*

2003/238 PP., 107 ILLUS./HARDCOVER/\$129.00
ISBN 3-540-00529-X

Easy Ways To Order

CALL Toll Free 1-800-SPRINGER

WEB www.springer-ny.com

E-MAIL orders@springer-ny.com

WRITE to Springer-Verlag New York, Inc.,
Dept. S6204, PO Box 2485, Secaucus, NJ
07096-2485

VISIT your local scientific bookstore or urge
your librarian to order for your department.
Prices subject to change without notice.

10/03

Promotion #96204



Springer

www.springer-ny.com

Notice of Council Meeting

Meetings of the GSA Council are open to Fellows, Members, and Associates of the Society, who may attend as observers, except during executive sessions. Only councilors and officers may speak to agenda items, except by invitation of the chair. Because of space and seating limitations, you will need to notify the Executive Director prior to the meeting if you plan to attend.

The next meeting of the Council will be at 1 p.m., Saturday, November 1, and at 1 p.m., Tuesday, November 4, at the GSA Annual Meeting in Seattle.

A L L T O P O M A P S

**-Search by Township, Range & Section!
-Export seamless, georeferenced, high resolution raster images!**



The 'All Topo Maps: PLS Tool' can display 1/4 1/4 section, or the footage offset from a chosen section corner, alternatively you can let ALL TOPO MAPS choose the nearest or highest precision section corner.

The fastest, most convenient and least expensive way to view, annotate and print or export the highest accuracy topographic maps.

Searchable by township, NGS control point, placename, mapname and geographic coordinate. Print and export full maps, portions of maps or seamed combinations at high resolution with no use restrictions.



iGage Mapping Corporation
+1 888 450-4922 • Fax +1 888 450-4983
www.igage.com

GSA 2004 RESEARCH GRANTS Program for Students

The primary role of the Research Grants Program is to provide partial support for research in earth science by graduate students at universities in the United States, Canada, Mexico, and Central America. GSA strongly encourages women, minorities, and persons with disabilities to participate fully in this grants program. **Eligibility is restricted to GSA members.** Application forms and details are available on GSA's Web site, www.geosociety.org/grants/gradstudents.htm. Applications must be downloaded from the Web but may **not** be submitted by facsimile or e-mail. They are also available upon request from the Program Officer, Grants, Awards and Medals, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA, awards@geosociety.org. Use only the current 2004 application and appraisal forms.

Confidential evaluations from two faculty members are required from candidates and must accompany submitted applications. Please use the "Appraisal of Applicant" forms that accompany the 2004 application forms. Application forms will not be accepted by facsimile or e-mail.

The Geological Society of America awarded \$465,087 in grants in 2003. The grants went to 251 students doing research for advanced degrees. The average amount awarded was \$1,853. Grants supported 44% of the applicants. Funding for this program is provided by a number of sources, including GSA's Penrose and Pardee endowments, the National Science Foundation, industry, individual GSA members through the GEOSTAR and Research Grants funds, and numerous

dedicated research funds that have been endowed at the GSA Foundation by members and families.

The Committee on Research Grants will meet soon after the deadline to evaluate applications and award grants. In late April, all applicants for grants will be informed of the committee's actions by GSA's executive director.

- Applicants must be members of GSA to apply.
- All applications must be submitted on the 2004 forms and postmarked by February 1, 2004.
- Only complete applications will be accepted.

new from the

SEPM BOOKSTORE...

AVAILABLE "AGAIN"

These titles have been "out of print" but are now being re-released on CD.

List Price: \$56.00; SEPM-Member Price: \$40.00

SPECIAL PUBLICATIONS ON CD

#41038 Roles of Organic Matter in Sediment Diagenesis;
Donald L. Gautier

#41039 Recent Developments in Fluvial Sedimentology;
F. Ethridge, R. Flores and M. Harvey

#41041 Sea-Level Fluctuations and Coastal Evolution;
Nummedal, Pilkey and Howard

#41044 Controls on Carbonate Platforms and Basin Development;
Paul Crevello, James Wilson, Frederick Sarg and Fred Read

SHORT COURSE NOTES ON CD

#61021 Origin and Migration of Subsurface Sedimentary Brines;
Jeffrey S. Hanor

#61025 Luminescence Microscopy and Spectroscopy: Qualitative and Quantitative Applications;
Charles A. Barker and Otto C. Kopp

#61031 Systematics of Fluid Inclusions in Diagenetic Minerals;
Robert H. Goldstein and T. James Reynolds

#61032 Introduction to Environmental Hydrogeology;
Eslinger, Oka, Smith and Holliday

#61034 Hydrocarbon Reservoir Characterization;
Emily Stoudt and Paul M. Harris

CONCEPTS IN SEDIMENTOLOGY/PALEONTOLOGY ON CD

#85101 Cross-Bedding, Bedforms and Paleocurrents;
David M. Rubin

CORE WORKSHOPS ON CD

#71012 Giant Oil and Gas Fields;
A.J. Lomando and P.M. Harris

#71017 Applications of Ichology to Petroleum Exploration;
S. George Pemberton



NEW RELEASES

SEPM Special Publication #74:

Paleozoic Carbonates of the Commonwealth of Independent States (CIS): Subsurface Reservoirs and Outcrop Analogs

Edited By: William G. Zempolich and Harry E. Cook

Catalog Number: 40074; ISBN 1-56576-083-2;
List Price: \$100.00; SEPM-Member Price: \$75.00

SEPM Special Publication #75

Micropaleontological Proxies for Sea-Level Change

Edited by: Hilary Clement Olson and R. Mark Leckie

Catalog Number 40075; ISBN 1-56576-084-0
List Price: \$137.00; SEPM-Member Price: \$95.00

SEPM Special Publication #76

Tropical Deltas of Southeast Asia—Sedimentology, Stratigraphy, and Petroleum Geology

Edited by: F. Hasan Sidi, Dag Nummedal, Patrice Imbert, Herman Darman, and Henry Posamentier

Catalog Number 40076; ISBN 1-56576-086-7
List Price: \$121.00; SEPM-Member Price: \$87.00

SEPM Special Publication #77

Climate Controls on Stratigraphy

Edited by: C. Blaine Cecil, N. Terence Edgar, Frank T. Dulong, and Sandra G. Neuzil

Catalog Number 40077; ISBN 1-56576-085-9
List Price: \$95.00; SEPM-Member Price: \$68.00

to order books or join the society, visit:

www.sepm.org

DEADLINES EXTENDED



PENROSE CONFERENCE

Neogene-Quaternary Continental Margin Volcanism

January 12-16, 2004

Metepec (eastern slopes of Popocatepetl volcano), State of Puebla, México

Conveners:

Gerardo J. Aguirre-Díaz
ger@geociencias.unam.mx

José Luis Macías
macias@tonatiuh.igeofcu.unam.mx

Claus Siebe
csiebe@tonatiuh.igeofcu.unam.mx

Application deadline: October 15, 2003

Abstract deadline: October 15, 2003

Registration payment due: November 1, 2003

More information and the application form is posted at www.geosociety.org (go to "Penrose Conferences" in Meetings & Excursions") and <http://tepetl.igeofcu.unam.mx/penrose/index.html>.

Call for Applications:

Apply for the GSA-USGS Congressional Science Fellowship for 2004-2005

Opportunities to serve as a Congressional Science Fellow are rare, unique experiences. This position may be a good fit for you. It will enable you to work directly with national leaders and put your expertise and experience to work helping shape science and technology policy on Capitol Hill.

The Congressional Science Fellow will be selected from top competitors early in 2004. Successful candidates are GSA members who possess either a:

- Ph.D. in the earth sciences (or a related field); or a
- Master's degree and at least five years of professional experience in the earth sciences or related field.

If you possess this professional background, have experience in applying scientific knowledge to societal challenges, and share a passion for helping shape the future of the geoscience profession, GSA invites your application. The fellowship is open to U.S. citizens or permanent residents of the U.S.

Deadline to apply: January 23, 2004.

For application information, visit www.geosociety.org/science/csf/, or contact

Ginger Williams, GSA Headquarters,
(303) 357-1040, gwilliams@geosociety.org.



Statement of Ownership, Management, and Circulation

(Required by Title 39 U.S.C. 4369)

GSA Today (Publication No. 1052-5173) is published monthly by The Geological Society of America, Inc., (GSA) with headquarters and offices at 3300 Penrose Place, Boulder, Colorado 80301 U.S.A.; and mailing address of Post Office Box 9140, Boulder, Colorado 80301-9140 U.S.A. The Publisher is Jon Olsen; the Managing Editor is Jeanette Hammann; their office and mailing addresses are the same as above. The annual subscription prices are: for Members and Student Associates, \$13; for non-members \$75. The publication is wholly owned by The Geological Society of America, Inc., a not-for-profit, charitable corporation. No known stockholder holds 1 percent or more of the total stock. CEDE & Company, 55 Water Street, New York, NY 10041, holds all outstanding bonds; there are no known mortgagees or holders of other securities. The purpose, function, and nonprofit status of The Geological Society of America, Inc., have not changed during the preceding twelve months. The average number of copies of each issue during the preceding twelve months and the actual number of copies published nearest to the filing date (September 2003 issue) are noted at right.

This information taken from PS Form 3526, signed September 19, 2003 by the Publisher, Jon Olsen, and filed with the United States Postal Service in Boulder, Colorado.

Item No. from PS Form 3526	Extent and Nature of Circulation	Avg. No. Copies Each Issue in past 12 Months	Actual No. Copies of Single Issue Published Nearest to Filing Date
a.	Total No. Copies (Net press run)	18,500	18,250
b.	Paid and/or Requested Circulation		
	(1) Sales through dealers and carriers, street vendors, and counter sales (not mailed)	0	0
	(2) Paid or Requested Mail Subscriptions, (Including advertisers) proof copies and exchange copies	18,277	17,710
c.	Total Paid and/or Requested Circulation (Sum of b (1) and b (2))	18,277	17,710
d.	Distribution by Mail (Samples, complimentary, and other free)	0	0
e.	Free Distribution Outside the Mail (Carriers or other means)	0	0
f.	Total Free Distribution (Sum of d and e)	0	0
g.	Total Distribution (Sum of c and f)	18,277	17,710
h.	Copies Not Distributed		
	(1) Office use, leftovers, spoiled	233	540
	(2) Returned from news agents	0	0
i.	Total (Sum of g, h (1), and h (2))	18,500	18,250
	Percent Paid and/or Requested Circulation (c/g x 100)	100%	100%



Photo by Ivo Luchitta

GeoTrip Rio Colorado: A Geologic Exploration of the Colorado River and Its Grand Canyon—Lee's Ferry to Diamond Creek

April 22–29, 2004 (8 days, 7 nights)

Scientific Leader: Ivo Luchitta, U.S. Geological Survey (emeritus), Flagstaff, Arizona. Ivo has been in, through, and around the Grand Canyon since 1963, when he started his Ph.D. dissertation in the upper Lake Mead area under the tutelage of Eddie McKee. His interests include continental extension (from the perspective of Colorado Plateau–Basin and Range interface); uplift of the Colorado Plateau; history of Grand Canyon and Colorado River; and Cenozoic/Quaternary geology, geomorphology, and processes, especially as applied to southwestern drainage systems.

Even though the stately succession of strata that form the imposing walls of the Grand Canyon will by no means be ignored, the geologic focus of the trip will be more on processes operating within the Canyon, its Quaternary geology and geomorphology, and the interrelation between the activities of the Colorado River and those of humans, including thorny subjects of current interest and unexpected insights into the activities of prehistoric Puebloan farmers.

Non-geologists on the trip will be treated to many talks presented in non-technical language and designed to make them aware of the wonderful stories Earth has to tell. The purpose of the trip is to learn, travel through some of the most remarkable scenery on Earth, enjoy good companionship, and have fun.

Fees and Payment: \$2875 for GSA members; \$2975 for nonmember spouses; \$3125 for nonmembers. A \$300 deposit is due with your reservation and is refundable through February 1, less a \$50 processing fee. The total balance is due February 1. Minimum: 14. *We are holding 14 spaces. Any additional spaces will be based on availability. If you would like to participate in this trip, we recommend that you register today.*

Included: Guidebooks to the river; geologic guide; ground transportation from Las Vegas to and from the river; waterproof bags for clothes; life jacket; camping gear including a two-person tent, sleeping bag and pad, and eating utensils; all river meals; and soft drinks on the river.

Not included: Airfare to and from Las Vegas; nights and meals in Las Vegas; alcoholic beverages.

Want to find out about all our latest GeoVenture trips?

Join our E-News GeoVentures list from our Web page, www.geosociety.org/geovertures.

REGISTER TODAY!

Send a deposit to hold your reservation; please pay by check or credit card. You will receive further information soon.

Name _____

Institution/Employer _____

Mailing Address _____

City/State/Country/ZIP _____

Phone (business/home) _____

E-mail _____

Guest Name _____

GSA Member # _____

	DEPOSIT PER PERSON	NO. OF PERSONS	TOTAL PAID DEPOSIT
GRAND CANYON	\$300	_____	\$_____
TOTAL DEPOSIT			\$_____

VISA MasterCard American Express Discover

Credit Card # _____ Exp. Date _____

Signature _____

MAIL OR FAX REGISTRATION FORM AND CHECK OR CREDIT CARD INFORMATION TO:

2004 GSA GeoVentures, GSA Sales and Service
P.O. Box 9140, Boulder, CO 80301
Fax 303-357-1071

MAKE CHECKS PAYABLE TO: GSA 2004 GeoVentures

Call for Geological Papers: 2004 GSA Section Meetings

South-Central Section

March 15–16, 2004

Texas A&M University, College Station, Texas

Abstract deadline: December 16, 2003

Information: Christopher Mathewson, Texas A&M University, Department of Geology & Geophysics, 3115 TAMU, College Station, TX 77843-3115, (979) 845-2488, mathewson@geo.tamu.edu

Northeastern–Southeastern Sections Joint Meeting

March 25–27, 2004

Hilton McLean Tyson's Corner, Washington, D.C.

Abstract deadline: December 16, 2003

Information: George Stephens, George Washington University, Department of Earth & Environmental Sciences, 2029 G St., NW, Washington, D.C. 20052-0001, (202) 994-6189, geoice@gwu.edu; Rick Diecchio, George Mason University, Department of Environmental Science & Policy, MS 572, 4400 University Dr., Fairfax, VA 22030-4444, (703) 993-1208, rdiecchi@gmu.edu

North-Central Section

April 1–2, 2004

Millennium Hotel, St. Louis, Missouri

Abstract deadline: January 6, 2004

Information: Joachim O. Dorsch, Saint Louis University, Department of Earth & Atmospheric Science, 3507 Laclede Ave., St. Louis, MO 63103-2010, (314) 977-3124, dorsch@eas.slu.edu

Rocky Mountain–Cordilleran Sections Joint Meeting

May 3–5, 2004

Center on the Grove, Boise, Idaho

Abstract deadline: January 27, 2004

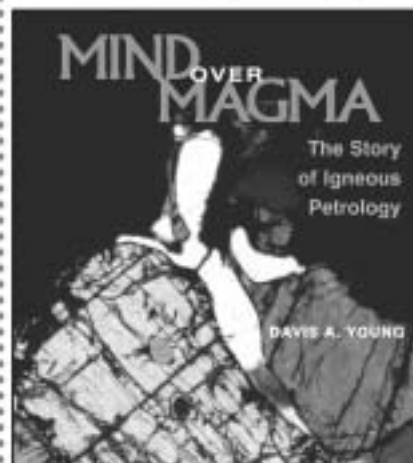
Information: C.J. Northrup, Boise State University, Department of Geosciences, 1910 University Dr., Boise, ID 83725, (208) 426-1009, cjnorth@boisestate.edu

www.geosociety.org/sectdiv/sections.htm

Attention Students!

When you make plans to attend your Section's meeting, be sure to include the Shlemon Mentor Program in your schedule. If you have questions about your career, we have the answers. You will have opportunities to chat one-on-one with practicing geoscientists over a **FREE LUNCH**. All Sections will feature this mentor program in their proceedings. Watch this space for dates and times for the 2004 Shlemon Mentor Programs.

HOT!



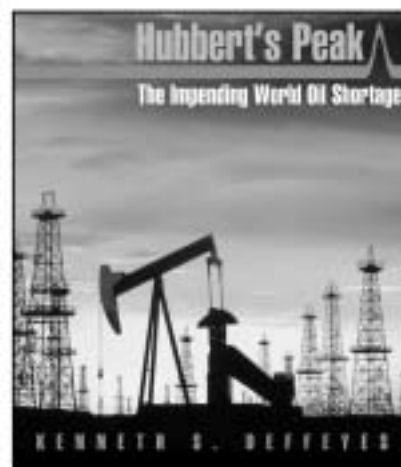
Mind over Magma

The Story of Igneous Petrology

Davis A. Young

Mind over Magma chronicles the scientific effort to unravel the mysteries of igneous rocks. It will be appreciated by all petrologists, geochemists, and other geologists as well as by anyone interested in the history of science.

Cloth: \$69.95 ISBN 0-691-10279-1



Revised and updated edition

Hubbert's Peak

The Impending World Oil Shortage

Kenneth S. Deffeyes

"This is an oilman and geologist's assessment of the future, grounded in cold mathematics. And it's frightening."
—Paul Roeburn, *Scientific American*
Paper \$16.95 ISBN 0-691-11625-3

PRINCETON
University Press

800-777-4726 • READ EXCERPTS ONLINE
WWW.PUP.PRINCETON.EDU

Ads (or cancellations) must reach the GSA Advertising office one month prior. Contact Advertising Department, (303) 357-1053, 1-800-472-1988, ext. 1053, fax 303-357-1073, acrawford@geosociety.org. Please include address, phone number, and e-mail address with all correspondence.

Classification	Per Line for 1st month	Per line each add'l month (same ad)
Situations Wanted	\$2.25	\$1.90
Positions Open	\$7.00	\$6.00
Consultants	\$7.00	\$6.00
Services & Supplies	\$7.00	\$6.00
Opportunities for Students		
first 25 lines	\$0.00	\$2.85
additional lines	\$1.85	\$2.85
Web Only Ads	\$7.00	\$6.00
live link: add \$25		

Agencies and organizations may submit purchase order or payment with copy. Individuals must send prepayment with copy. To estimate cost, count 54 characters per line, including all punctuation and blank spaces. Actual cost may differ if you use capitals, centered copy, or special characters.

Situations Wanted

My Yankee wife wants to go home! British PhD hydrogeologist seeks interesting employment in USA or Canada. Details on www.propubs.com/resume.

Positions Open

UNIVERSITY OF WEST FLORIDA ASSISTANT PROFESSORS HYDROGEOLOGY & GEOLOGY

The Department of Environmental Studies, University of West Florida, invites applications for two tenure-track assistant professor positions beginning August 2004.

Position 1. Hydrogeology. We seek candidates with expertise in applied groundwater hydrology or water/land surface interactions. Interest in environmental issues is highly desirable, and candidates will be expected to teach both lower-division as well as upper-division classes in geology and hydrology.

Position 2. Geology, specialization open. We seek candidates whose expertise would mesh well in an environmental science program. Specialization in coastal geology, oceanography, geohazards, or environmental geochemistry preferred. Distance learning experience highly desirable.

Applicants are expected to develop an active research program and should be committed to peer-reviewed publication. Applicants must have an appreciation for undergraduate education. A Ph.D. in geology or related discipline is required at the time of appointment. Salary is commensurate with qualifications and experience.

The Department of Environmental Studies offers a bachelor of science degree, and a Certificate in Geographic Information Science. Over 120 majors specialize in tracks in natural science, environmental policy, and geography. A Master's program is planned effective Fall 2004. The department is housed in a renovated building with new research and teaching facilities. The department maintains the university-wide GeoData Center, which has extensive GIS capabilities. Personnel include 7 full-time faculty, several adjunct faculty, and a GIS Coordinator. For more information on the department see <http://uwf.edu/environmental/>.

Candidates are requested to submit a statement of research and teaching interests and experience, a curriculum vitae, transcripts, and three letters of reference. Review of applications will begin November 15, 2003 and will continue until the position is filled.

For Position 1, apply: Dr. Johan Liebens, Department of Environmental Studies, University of West Florida, 11000 University Parkway, Pensacola, FL 32514, phone 850-474-2065, fax 850-857-6036, or email liebens@uwf.edu.

For Position 2, apply: Dr. Klaus Meyer-Arendt, Department of Environmental Studies, University of West Florida, 11000 University Parkway, Pensacola, FL 32514, phone 850-474-2792, fax 850-857-6036, or email kjma@uwf.edu.

The University of West Florida is an Equal Opportunity/Access/Affirmative Action Employer. Minorities and women are encouraged to apply.

DEPARTMENT OF GEOLOGICAL SCIENCES COLLEGE OF NATURAL SCIENCE AND MATHEMATICS

CALIFORNIA STATE UNIVERSITY, FULLERTON

Hydrogeochemist/Hydrologist, Tenure Track

The Department of Geological Sciences invites applications for a tenure-track position starting August 2004. The Department has 11 full-time faculty with expertise in physical hydrogeology, geomorphology, paleoclimatology, seismology, engineering geology, tectonics and petrology. We have about 50 undergraduate majors and 25 MS students. The nearby geological provinces provide abundant opportunities for field-based research, which the department emphasizes in its curriculum. The Department operates summer hydrogeology field camps at Mammoth Lakes and Orange County, CA. See <http://geology.fullerton.edu/> for additional information.

Position

Teaching responsibilities may include, but not be limited to, undergraduate and graduate courses in hydrogeochemistry, contaminant fate and transport, hydrogeology, aqueous geochemistry, field hydrogeology/hydrology, and physical geology. Research activities must result in publications in refereed journals. Supervision of both undergraduate and graduate student research projects is required.

Qualifications

The successful applicant will have the following credentials and capabilities:

A Ph.D. in geology or a related discipline at the time of appointment.

A primary interest in achieving excellence in teaching.

A vigorous, field-based research program in hydrogeochemistry that would involve undergraduate and graduate students.

An ability to interact with faculty in physical hydrology, geomorphology, paleoclimatology and stable isotope geochemistry would be considered favorably.

Rank and Salary

This position will be filled at the rank of Assistant Professor; salary is competitive and commensurate with experience and qualifications. An excellent comprehensive benefits package is available.

Appointment Date

August 19, 2004

Application Procedure

To apply, please send (1) a detailed curriculum vita, (2) a letter of application that explains how you meet the qualifications outlined above, (3) a statement about teaching that includes a discussion of relevant course work and/or experience in preparation for teaching, a list of courses you would feel comfortable teaching, and a statement of your teaching philosophy, (4) a statement of your future research plans and goals, and (5) letters of recommendation from at least three references familiar with your teaching and research potential. Referees should send their letters to: Dr Diane Clemens-Knott, Search Committee Chairwoman, Department of Geological Sciences, California State University, PO Box 6850 Fullerton, California 92834-6850.

Application Deadline

Applications will be accepted until the position is filled. To assure full consideration, submit applications by November 19, 2003.

CV State Fullerton is an Equal Opportunity/Title IX/504/504-CALVE/ADA Employer.

THE SAVANNAH RIVER TECHNOLOGY CENTER

The Savannah River Technology Center at the U.S. Department of Energy (DOE) Savannah River Site (SRS) in South Carolina has two employment opportunities: (1) Environmental Scientist/Engineer in the Environmental Restoration Technologies Section (ERTS), and (2) Groundwater Fate & Transport Modeler in the Waste Processing Technology Section (WPT). The candidates will support environmental remediation and waste management in the DOE complex through analyses ranging from research and development to operations support. Projects will generally involve an interdisciplinary team effort supporting subsurface characterization and remediation at the SRS. Duties will center on groundwater flow and contaminant transport analysis, but also include a combination of applied mathematics, computer programming, analysis of large data sets, 3-D visualization for geologic and physical property models, and field projects. Results will be communicated through formal technical reports, oral presentations, and refereed journal publications.

Environmental Geoscientist/Engineer

The ERTS section is seeking an environmental scientist/engineer with a strong geological and mathematical background. A candidate with expertise in multi-phase flow and transport simulation, UNIX skills, experience in the DOE complex, broad interdisciplinary experience, and demonstrated team/project leadership is preferred. A strong research background in computer modeling and simulation of transport phenomena is required, as

demonstrated through publications and professional activities. Experience in computational geosciences and strong computer programming skills involving a high-level language is essential, along with ability to integrate laboratory and field data with subsurface processes. A candidate must have an ability to collaborate with multiple disciplines for proposal submittal within the DOE complex, and a PhD in the geosciences or environmental engineering and research publication record with five to 10 years experience. Candidates will also be considered with a Ph.D. in the listed disciplines obtained within the last 2 to 5 years with a strong research and publication background.

Groundwater Fate & Transport Modeler

The WPT section is seeking a scientist or engineer (Ph.D. & at least 2 yrs experience, M.S. & at least 5 yrs experience, or B.S. & at least 7 yrs experience) with experience using groundwater flow and transport models to simulate migration of chemicals and radionuclides in both the saturated and vadose zones. A candidate with a working knowledge of the PORFLOW analytical fate and transport code is highly preferred. Other desirable skills include experience in low-level/hazardous/mixed waste technical and regulatory issues, analytic assessment programs (e.g., MEPAS, RESRAD, PATHRAE), familiarity with the DOE complex, demonstrated team/project experience and good oral and written communication skills. This work is an integral part of the disciplined radioactive waste management program at SRS.

For consideration please forward résumé, salary history and three references (names, addresses, phone numbers and email) to Mr. Lamar Cherry, Westinghouse Savannah River Company, Employment, Bldg. 719-4A, Aiken, SC 29808, Fax: (803) 725-8781, Email: lamar.cherry@srs.gov.

Westinghouse Savannah River Company - An Equal Opportunity Employer.

U.S. Citizenship & ability to obtain DOE clearance REQUIRED.

SRS is located in a mild climate with easy access to some of the Southeast's most attractive cultural, recreational and educational resources (Atlanta, Augusta, Charlotte, Columbia, Charleston, Hilton Head and Savannah).

DIRECTOR

FOUNDATION FOR GLACIER AND ENVIRONMENTAL RESEARCH

The Director will be responsible for management and program development for the foundation's unique 57 year-old, multi-disciplinary field sciences training program, focused on earth systems, environmental science and global change. Extensive facilities are available on the Juneau Icefield, Alaska and in northern British Columbia. Cooperative projects are being developed in Patagonia, Nepal and Asia. The Director will coordinate and maintain liaison with the academic community, and help broaden and intensify the quality of program plans. An advanced degree (preferably a Ph.D.), with experience in research and teaching of earth systems science is required. This is a great opportunity for an energetic, enthusiastic, motivated and visionary individual to lead and expand a vital non-profit organization and to make an impact on the regional, national and international geosciences educational community. The program is headquartered in Juneau, Alaska. Send cover letter, resume and three references to Search Committee, Box 20298, Juneau, AK, 99802. For more information see www.juneauicefield.org and www.crevassezone.org.

IGNEOUS/METAMORPHIC PETROLOGY CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

The Department of Geological Sciences invites applications for a tenure-track faculty appointment at the assistant professor level. Requirements are a Ph.D., an established record of published research in the area of igneous or metamorphic petrology, a demonstrated record of teaching ability, and strong field skills. Preference will be given to applicants with experience in obtaining research funding, and who have research interests that complement and enhance existing departmental strengths. Teaching assignments will include mineralogy, igneous and metamorphic petrology, a senior and/or graduate course in the hire's specialty, and, on a rotational basis, physical science for prospective K-5 teachers and appropriate general-education courses.

To apply send as e-mail attachments a curriculum vitae; statements of teaching and research interests; and names and addresses of at least three referees to j.d.yule@csun.edu. Include "Ig/Met Petrology Application" in the subject line. Ancillary materials, such as copies of recent publications, may be mailed to: Dr. Doug Yule, Department of Geological Sciences, California State University, 18111 Nordhoff Street, Northridge, CA 91330-8266. Review of applications will begin January 5, 2004 and continue until the position is filled.

For additional information see: www.csun.edu/geology. The University is an EO/AA educator and employer. Candidates will be expected to provide effective instruc-

tion to students of diverse backgrounds in a multicultural setting. Position is subject to final approval of budget.

PALEONTOLOGIST, OHIO UNIVERSITY

The Department of Geological Sciences at Ohio University invites applications for a tenure-track appointment at the assistant professor level in paleontology to begin September 2004. We are seeking an individual who is committed to both research and teaching, and is qualified to develop courses in paleontology that will expand and complement existing departmental strengths in sedimentology and earth systems science as well as university research programs in paleobotany and evolutionary biology. Capability in invertebrate paleontology is particularly desirable. Excellence in teaching at both the undergraduate and graduate level and supervision of M.S. student research must be complemented by the development of a strong research program supported by external funding. The successful applicant will possess a Ph.D. in geological sciences or a related discipline.

Applicants should send vitae, a description of research interests, a statement of teaching philosophy, graduate transcripts, and the names and addresses of three referees to: Search Committee Chair, Department of Geological Sciences, 316 Clippinger Laboratories, Ohio University, Athens, Ohio 45701-2979. Applications should be received by December 12, 2003, but will be considered until the position is filled. Ohio University is an affirmative action/equal opportunity employer: women and minorities are especially encouraged to apply. For further information concerning the College of Arts and Sciences, the Department of Geological Sciences and its faculty, visit www.cas.ohiou.edu and www.ohiou.edu/geology.

ASSISTANT PROFESSOR—SURFICIAL GEOLOGY INDIANA UNIVERSITY NORTHWEST

Tenure-track position available August 2004. Ph.D. required. Broadly trained geologist with a strong desire to work in an undergraduate department focusing on excellence in teaching/research. Primary teaching responsibilities in hydrogeology, introductory courses; upper division courses in area of expertise. Area of expertise is open within the broad category of surficial/near surface processes. Will be expected to contribute to interdisciplinary MS degree in Environmental Studies the campus is currently developing. Complete announcement available at www.iun.edu/~jobsnw. Send letter of application, statement of teaching and research interests, CV, official transcripts, and three reference letters to: Geology Search Committee, Indiana University Northwest, 3400 Broadway, Gary, IN 46408-1197. Full consideration given to applications received by January 15, 2004. AA/EEO employer with commitment to recruiting and retaining a diverse faculty and staff.

TENURE-TRACK POSITION STRATIGRAPHY/SEDIMENTOLOGY OR STRUCTURAL GEOLOGY OR HYDROGEOLOGY/ENVIRONMENTAL GEOLOGY APPALACHIAN STATE UNIVERSITY

Department of Geology at Appalachian State University invites applications for a tenure-track position at the Assistant Professor level, beginning August 2004. The candidate must have a Ph.D. and possess a strong commitment to undergraduate education and research. We seek a geologist with expertise in stratigraphy and sedimentology, or structure/tectonics, or hydrogeology/environmental geology, and experience in field-based research. Candidates are expected to take advantage of the regional geologic setting of the Southern Appalachians in their teaching of upper-level courses. Preference will be given to candidates who possess interest and experience in one or more of the following: environmental/engineering geology, geophysics, field techniques, summer field camp.

Applications must include a letter of interest, vita, a statement of career goals, transcripts of all college and university work, and the names and contact information (including e-mail) of three referees familiar with the applicant's work in teaching and scholarship. Send applications to Dr. Richard N. Abbott, Chair of Search Committee, Department of Geology, Appalachian State University, P.O. Box 32067, 195 Rankin Science Bldg., Boone, NC 28608-2067. Review of completed applications will begin November 10, 2003 and will continue until the position is filled.

Appalachian State is a comprehensive university and a member of the University of North Carolina System. The Department of Geology offers several B.A. and B.S. degrees. Appalachian State University is an Equal Employment Opportunity/Affirmative Action employer.

GEOCHEMISTRY, THE UNIVERSITY OF TULSA

The Department of Geosciences invites applications for a tenure-track faculty position at the Assistant Professor level to begin August 2004. A Ph.D. degree in geology or related field with demonstrated experience in Geochemistry is required. We seek an individual who



Biogeochemistry/Aqueous Geochemistry Faculty Position

Rice University
Department of Earth Science

The Earth Science Department anticipates filling one new tenure line position in the general field of low temperature geochemistry. We are particularly interested in hiring an earth scientist who uses chemistry or microbiology to solve a broad range of earth systems processes such as mineral precipitation/ dissolution, soil formation, gas production/ consumption, metal transport, environmental remediation, and life in extreme environments.

Successful candidates are expected to establish forefront research programs, supervise graduate research, and to teach courses for both undergraduate and graduate students. We are especially interested in individuals who would bring to our department opportunities for collaboration while allowing us to expand into new and emerging fields of research. Rice University is a private university whose administration and faculty are dedicated to outstanding research and education at the undergraduate and graduate levels.

Applications at all academic levels will be considered; those received by December 1, 2003 are assured of receiving fullest attention. Please send a resume and names of four or more references to: Search Committee Chair, Earth Science Department, MS-126, Rice University, PO Box 1892, Houston, TX 77251-1892

Information about the department can be found at

<http://earthscience.rice.edu/>

Rice is an equal opportunity affirmative action employer.

shows the potential for outstanding achievement in both research and teaching. The successful candidate will be expected to develop and teach courses at the undergraduate and graduate levels, and will be expected to establish an externally funded research program. In addition, interdisciplinary research with existing petroleum and environmental science and engineering programs is encouraged. The University of Tulsa is a private, comprehensive university committed to excellence in teaching, creative scholarship, and service to the University and community. Minorities and women are encouraged to apply. Send a letter of application stating research and teaching interests, curriculum vita, and name and contact information for three references to Dr. Bryan Tapp, Chair, Department of Geosciences, The University of Tulsa, 600 South College Ave. Tulsa, OK 74104-3189. Application review will begin November 1, 2003 and continue until position is filled. The University of Tulsa does not discriminate on the basis of personal status or group characteristics including but not limited to the classes protected under federal and state law. The University of Tulsa is an EEO/AA employer.

ANTICIPATED FACULTY POSITION IN "SOFT ROCK" GEOLOGY

JUNIATA COLLEGE, HUNTINGDON, PA

The Department of Geology at Juniata College—a private, liberal arts college in Central PA, highly regarded for academic excellence—invites applications for an anticipated one-year sabbatical replacement for 2004/05. Teaching duties will include Historical Geology, Stratigraphy/Sedimentology, Oceanography and associated labs. The successful candidate will have strong field skills and a willingness to utilize excellent local exposures for fieldtrips during lab periods. Ph.D. preferred, although ABD considered. A commitment to excellence in undergraduate education is a must.

The Department consists of three full time faculty and one emeritus. A large proportion of our ~30 majors go on to graduate schools. The Department has excellent field and laboratory instrumentation/equipment which is available for student course work as well as faculty and student research. To learn more about the Department, visit <http://departments.juniata.edu/geology/>.

Send letter of application, curriculum vitae, statement

of teaching philosophy, and three letters of recommendation by December 1, 2003, to Gail Leiby Ulrich, Director of Human Resources, Juniata College, 1700 Moore Street, Box BB, Huntingdon, PA 16652. AA/EEO.

HOFSTRA UNIVERSITY ASSISTANT PROFESSOR SEDIMENTOLOGY/FIELD GEOLOGY

The Department of Geology, Hofstra University, invites applications for a tenure track position at the assistant professor level beginning September 2004. We seek a candidate with a background in sedimentology and field geology who is strongly committed to excellence in undergraduate teaching and research. The successful candidate will have a nine contact hour per semester teaching load and will be expected to teach one introductory level and one advanced undergraduate course per semester. The ideal candidate will teach physical geology and should be prepared to offer advanced laboratory courses in sedimentology and field methods, as well as one additional advanced course in a topic of interest to the candidate. We are looking for a dynamic individual who combines excellence in teaching with breadth and versatility in professional productivity, and who shares our commitment to close student-faculty interaction, including a vigorous program of field trips and student involvement in faculty research and professional activities.

Hofstra University is located in suburban Long Island, New York, about 25 miles from Manhattan. The University occupies a beautiful 240 acre campus that is also a registered arboretum and enrolls over 13,000 undergraduate and graduate students. The Geology Department consists of four full time and seven adjunct faculty and offers undergraduate degrees in Geology and Environmental Resources.

Applicants should have their Ph.D. completed by September, 2004. Send a letter of introduction discussing your teaching and research interests, a curriculum vitae, and three supporting letters to: Dr. Dennis Radcliffe, Chair – Department of Geology, 114 Hofstra University, Hempstead, NY 11549-1140. We will begin reviewing applications on November 15, 2003.

Hofstra University is an equal opportunity employer and is dedicated to ethnic and cultural diversity among the faculty and student body.

**ASSISTANT PROFESSOR IN
TERRESTRIAL PALEOECOLOGY
UNIVERSITY OF IOWA**

The Department of Geoscience at the University of Iowa invites applications for a full-time tenure-track Assistant Professorship in terrestrial paleoecology. The appointment will begin in August 2004. We seek an outstanding researcher and teacher who uses modern quantitative and analytical techniques to reconstruct and interpret the Earth's nonmarine ecosystems and natural history. Desirable qualifications include a research emphasis that complements existing faculty research and teaching, including but not limited to expertise in community paleoecology, the evolution of terrestrial ecosystems, or the use of biotic information for understanding regional or global change. In addition to developing an active, externally-funded program of research, the successful candidate will be expected to teach three courses per academic year, which includes participating in a rotation team for a general education course in Environmental Sciences. Applicants must have a Ph.D. in hand by August 2004. Women and minorities are especially encouraged to apply. Applicants should send a complete resume (including a bibliography and statement of teaching and research interests) and have at least three letters of recommendation sent to: Search Committee Chair (Terrestrial Paleoecology), Department of Geoscience, University of Iowa, Iowa City, IA 52242-1379 (geology@uiowa.edu, Phone: 319/335-1818; Fax: 319/335-1821). Screening of candidates begins December 1, 2003, and will continue until the position is filled. The University of Iowa is an affirmative action - equal opportunity employer.

ASSISTANT PROFESSORS, UNIVERSITY OF CHICAGO

The Department of the Geophysical Sciences at The University of Chicago is seeking to make several new appointments in areas that complement our current strengths in Paleobiology, Solid Earth, and Atmosphere and Ocean Sciences. Information about the Department can be found at <http://geosci.uchicago.edu>. The appointments will be at the Assistant Professor-level, except in exceptional cases. Strong preference will be given to candidates whose research has a substantial, lab- or field-based observational or experimental component. Candidates must have completed the Ph.D. prior to appointment. Please send a curriculum vitae, statement of research interests, and contact information for three or more referees to: David B. Rowley, Chair, Department of the Geophysical Sciences; The University of Chicago; 5734 South Ellis Avenue; Chicago, IL 60637 USA or via email to facjobs@geosci.uchicago.edu. Consideration of applications will begin September 30, 2003. The University of Chicago is an Affirmative Action/Equal Opportunity Employer.

NCKRI SCIENCE COORDINATOR

New Mexico Institute of Mining and Technology seeks a NCKRI Science Coordinator to provide science coordination, leadership, and scientific direction for the National Cave and Karst Research Institute located in Carlsbad, N.M. Reports to NCKRI Director on issues pertaining to science advancement goals, funding strategies, and scope of NCKRI science activities. Master's degree required; Ph.D. preferred subject relevant to speleology. Familiarity with at least one aspect of speleological science required. Familiarity with more than one aspect of speleological science desired. Must be familiar with the cave and karst scientific community. Familiarity with the general scientific community desired. Ability to write well required. Experience with grant proposals to agencies and private foundations desired. Experience as college faculty member and teaching at college level desired. Good verbal communication ability required. Transcripts required. Applicants should send a resume, transcripts, and the names, email addresses and phone numbers of three employment references to: New Mexico Institute of Mining and Technology, 801 Leroy Pl., Human Resources Wells Hall Box 93C, Socorro, NM 87801. For information about New Mexico Tech, visit our web page <http://www.nmt.edu/> E-mail applications NOT accepted. AAEOE

**EDUCATION: COASTAL SEDIMENTARY PROCESSES
OPEN RANK
UNIVERSITY OF DELAWARE**

The Department of Geology at the University of Delaware seeks applicants for a tenure track position in coastal and near-shore marine sedimentary processes. Appointment may be at any rank commensurate with the applicant's qualifications and experience. Essential qualifications include a Ph.D. in a relevant scientific discipline (Geology, Engineering, Oceanography, Geography, etc.), significant publications, demonstrated ability to secure external funding, and significant teaching experience at the expertise in field studies, numerical and physical modeling, GIS and remote sensing, and other areas. The successful applicant will be expected to develop a vigorous externally funded

program resulting in significant scholarly research and publication, and to teach graduate and undergraduate courses. The successful applicant will interact with faculty in and outside of the Geology Department and will have research expertise that complements available expertise at the University of Delaware. Current departmental research programs (described at www.geology.udel.edu) are focused on near surface processes of coastal and marine geoscience, including shallow geophysics, micro-paleontology of marginal-marine environments, fluvial geomorphology, and Quaternary Atlantic Coastal Plain stratigraphy. In addition to members of the Geology Department, scientists in the College of Marine Studies (www.ocean.udel.edu), the Delaware Geological Survey (www.udel.edu/dgs/), and the Center of Applied Coastal Research (housed in the Department of Civil and Environmental Engineering, www.coastal.udel.edu) offer important opportunities for collaboration. Furthermore, the successful applicant can anticipate helping to reshape the Department as a significant number of current faculty members retire in the next several years. Applicants should send a curriculum vitae, statement of research and teaching interest, and names of three references by January 5, 2004 to Coastal Geology Search Committee, Department of Geology, University of Delaware, Newark, DE 19716. The curriculum vitae and letters of reference shall be shared with departmental faculty. The UNIVERSITY OF DELAWARE is an Equal Opportunity Employer which encourages applications from Minority Group Members and Women.

**QUATERNARY PROCESSES POSITION AT THE
UNIVERSITY OF CINCINNATI**

The Department of Geology at the University of Cincinnati invites applications for a tenure-track faculty position at the assistant professor level in the area of Quaternary Processes with an emphasis on glacial processes beginning in Spring 2003. This hire is intended especially to enhance research and graduate student training in the surface process group, which currently has strengths in Quaternary stratigraphy, slope processes, earth surface and geochemical processes. The Department of Geology seeks to maintain and strengthen its traditional research approach to problems of global interest from field-based observation and laboratory analysis.

Areas of expertise for this position might include: geochronology, fluvial and lacustrine sedimentation in the glacial environment, entrainment, transport, or deposition of glacial debris, glacial erosion, glaciology and global climate change.

The successful applicant will be expected to supervise graduate research, participate in graduate and undergraduate teaching, and establish an externally funded research program. Candidates must demonstrate active research activity as exemplified by peer-reviewed publication and grants and show potential for interacting with existing programs in the Department (e.g. sedimentology, ground water hydrology) and in related disciplines (e.g. Geography, Biology, Engineering, Environmental Studies).

Interested candidates should send current vita, statement of research and teaching interests and three letters of recommendation to address below. Review of applications will begin on 10 October 2003. The successful candidate must have a Ph.D. degree at the time of appointment. The Department of Geology especially encourages the application of qualified women and minorities. The University of Cincinnati is an affirmative action/equal opportunity institution.

For more information please contact: Chair, Quaternary Processes Search Committee, Department of Geology, 500 Geology/ Physics Building, University of Cincinnati, Cincinnati, OH 45221, 513-556-3732.

**POMONA COLLEGE FACULTY POSITION
PALEO/SEDIMENTOLOGY**

The Geology Department at Pomona College, the founding member of the Claremont Colleges, invites applications for a tenure-track position at the level of Assistant Professor beginning July 1, 2004. Candidates with significant teaching experience are encouraged to apply. The candidate must have a strong commitment to quality undergraduate teaching in a liberal arts environment and to establishing an active research program involving undergraduates in field and laboratory components. Teaching responsibilities will include historical geology, sedimentology, introductory and specialty courses. The ideal candidate will have a research direction which complements those already in the department - such research areas might include paleoclimatology, paleobiology, paleoecology, sedimentology, or coastal studies. Applicants should send a letter of interest, curriculum vitae, undergraduate and graduate transcripts, a statement of teaching philosophy, a summary of research plans and three letters of reference to **Professor Linda Reinen, Geology Department, Pomona College, Claremont, CA 91711**. Web address: <http://www.geology.pomona.edu>; email: lreinen@pomona.edu. Review of completed applications will begin November 21, 2003. Pomona College is an equal opportunity employer, and it especially invites applications from women and members of under-represented groups.

<http://www.geology.pomona.edu>; email: lreinen@pomona.edu. Review of completed applications will begin November 21, 2003. Pomona College is an equal opportunity employer, and it especially invites applications from women and members of under-represented groups.

**CALIFORNIA STATE UNIVERSITY, SACRAMENTO
DEPARTMENT OF GEOLOGY
TENURE TRACK FACULTY POSITION
NEOTECTONICS/SEISMOLOGY**

The Department of Geology at CSUS seeks to fill a tenure-track faculty position with emphasis in neotectonics or seismology at the Assistant Professor level, effective August 22, 2004. Field-based skills and experience are essential and candidates with strengths and experience in GPS, GIS and field mapping are highly desirable. Enthusiasm and a strong commitment to teaching and mentoring are essential. CSUS has a vibrant and growing program in undergraduate and graduate geology. This is one of two open positions.

Review of applications begins October 15, 2003. Submit resume, letter of application, statement of teaching interests, statement of research interests, transcripts (unofficial OK), three letters of reference and corresponding phone numbers to: Chair of Search Committee, Department of Geology, California State University, Sacramento, 6000 J Street, Sacramento, CA 95819-6043 AA/EO.

Please see further details at: <http://www.csus.edu/fas/vacancies/nsmvac.htm> or <http://www.asn.csus.edu/geol/>.

**CALIFORNIA STATE UNIVERSITY, SACRAMENTO
DEPARTMENT OF GEOLOGY
TENURE TRACK FACULTY POSITION
LOW TEMPERATURE GEOCHEMISTRY**

The Department of Geology at CSUS seeks to fill a tenure-track faculty position with emphasis in low temp geochemistry at the Assistant Professor level, effective August 22, 2004. Applicants must hold a Ph.D. in Geology by the time of appointment. Enthusiasm and a strong commitment to teaching and mentoring are essential. Prior teaching experience at the college level is desired. Preference will be given to applicants who have demonstrated the ability to work well with students from diverse backgrounds and with abilities and willingness to teach marine geology. Applicants must be able to teach upper division / graduate courses in their discipline, as well as introductory general and physical geology lecture and laboratory courses. Other duties will include advising students, committee assignments, community service, writing external grant proposals, and developing a research program involving undergraduate and graduate students. The position is tenure-track at the rank of Assistant Professor. Salary range: \$43,632-\$55,008 commensurate with experience.

Applicants must submit a one to two page letter of application addressing their fitness for the position described above, a statement of teaching interests and experience, a statement of scholarly interests and experience (particularly in the context of doing research with undergraduate students), official transcripts of all college work (unofficial copies accepted until invited for interview), a curriculum vitae, three letters of recommendation sent directly to the department search committee, and the telephone numbers of at least three references who will speak to the professional qualifications of the applicant. Deadline for the application is October 15, 2003. Reply to: Chair of Search Committee, Department of Geology, California State University, Sacramento, 6000 J Street, Sacramento, CA 95819-6043.

Please see further details at: <http://www.csus.edu/fas/vacancies/nsmvac.htm> or <http://www.asn.csus.edu/geol/>.

**CARBONATE RESERVOIR GEOLOGIST and
WELL-LOG PETROPHYSICIST
THE PETROLEUM INSTITUTE, ABU DHABI**

The Petroleum Geosciences Program of The Petroleum Institute, Abu Dhabi, is seeking a carbonate reservoir sedimentologist-stratigrapher and a well-logging petrophysicist, although other specializations will be considered.

Applicants should possess a Ph.D. in Geology or Geophysics and experience in the petroleum industry is desirable. Appointments probably will be at the Assistant Professor rank, although senior appointments will be considered for strong candidates. Faculty in Petroleum Geosciences will teach undergraduate and graduate courses, develop an active research program that impacts the UAE petroleum industry, and engage in service work. Opportunities exist to work with PI industry stakeholders in research.

The Petroleum Institute is a small, highly focused, new teaching and research institute that offers educational programs that will lead to B.Sc., M.Sc., and Ph.D. degrees in engineering and petroleum geosciences. Staff will have the resources to equip laboratories with up-to-date analytical equipment and computer software and hardware to

support teaching and research. The Colorado School of Mines is the PI's academic advisor.

The compensation package for staff includes a 12-month salary and benefits that include housing, utilities, home furnishings, an automobile purchase loan, health insurance, and annual leave travel.

This is an unusual opportunity for self-motivated geoscientists to help build a world-class teaching and research institution. Additional information is at www.pi.ac.ae/. Interested candidates should send an application letter and their résumé by 31 September 2003, although late applications may be considered, to: Human Relations, Geoscience positions, Petroleum Institute, P.O. Box 2533, Abu Dhabi, United Arab Emirates; with an email copy to: Dr. Robert Winn, Petroleum Geosciences, rwin@pi.ac.ae.

**THE CALIFORNIA INSTITUTE OF TECHNOLOGY
GEOLOGICAL AND PLANETARY SCIENCES
O.K. EARL AND TEXACO
POSTDOCTORAL FELLOWSHIPS**

The California Institute of Technology announces two fellowships in Geological and Planetary Sciences. The O.K. Earl and Texaco Postdoctoral Fellowships are awards funded by endowments from Orrin K. Earl, Jr. and the Texaco Philanthropic Foundation. Each fellowship carries an annual stipend of \$44,000 plus a research expense fund of \$2,000 per year and one-way travel costs to Pasadena. The duration of each appointment is normally two years, contingent upon good progress in the first year, beginning with the 2004-05 Fall term. Fellows are eligible to participate in Caltech's health and dental program.

These fellowships have been established to support the research of scientists typically within two years after receipt of the Ph.D. The intent of the program is to identify and support innovative and creative work in the earth and planetary sciences, with particular emphasis on interdisciplinary work. Applicants with training in physics, chemistry, biology, or computer sciences are urged to apply. The Caltech family is currently active in geobiology, geochemistry, geology, geophysics, petrology, seismology, environmental science and engineering, and atmospheric and planetary sciences. It is expected that each fellowship recipient will be hosted by a division professor (designated by the Chairman) who will provide both financial support and intellectual guidance.

Applications may be obtained through the Division website at www.gps.caltech.edu or by contacting Alexandra Katsas by email at: katsas@gps.caltech.edu. Completed applications with references are due by Friday, December 19, 2003.

Fellowship candidates will automatically be considered for other available postdoctoral positions at Caltech in their fields of interest.

Caltech is an Affirmative Action/Equal Opportunity Employer. Women, minorities, veterans, and disabled persons are encouraged to apply.

**FACULTY POSITION IN GEOMICROBIOLOGY
UNIVERSITY OF WISCONSIN—MADISON**

The Department of Geology and Geophysics solicits applications for a faculty position in Geomicrobiology. We seek applications from scientists across a broad range of disciplines who are interested in microbial interactions with fluids and minerals in modern and/or ancient environments. The position will include major new facilities dedicated to geomicrobiological research. Opportunities exist for collaborative research with members in the Department who are interested in paleobiology, low-temperature geochemistry (including mineral-fluid interface chemistry), hydrogeology, and isotope geochemistry. An additional new position in mineralogy, as well as a new ion microprobe facility, provide further opportunities for collaborative research. Beyond the Department, outstanding resources in microbiology, genomics, molecular biology, materials science, soil science, environmental engineering, and chemistry are available on the Madison campus.

Appointment level will be contingent upon qualifications. Screening of applicants will begin November 1, 2003, and the position will remain open until filled. Interested applicants should send a full vitae, including a statement of research and teaching interests, several reprints/preprints, and contact information for 3-5 letters of reference to Prof. Clark M. Johnson, Geomicrobiology Search Committee Chair, Department of Geology and Geophysics, 1215 W. Dayton Street, University of Wisconsin, Madison, WI 53706, U.S.A.

Further information about the search and the department may be found at www.geology.wisc.edu or by contacting Prof. Johnson at clarkj@geology.wisc.edu. UW-Madison is an equal opportunity/affirmative action employer and encourages applications from women and minorities. Unless confidentiality is requested in writing, information regarding applicants must be released upon request. Finalists cannot be guaranteed confidentiality.

**FACULTY POSITION IN MINERALOGY
UNIVERSITY OF WISCONSIN—MADISON**

The Department of Geology and Geophysics solicits applications for a faculty position in Mineralogy at the Assistant Professor level. Applicants should have demonstrated research interests in any broadly defined area of Mineral Physics, Mineral Chemistry, or Biomineralization. Opportunities exist for collaborative research with a wide variety of areas in the department, including geochemistry, petrology, geophysics, sedimentary geology, and hydrogeology. An additional new position in geomicrobiology, as well as a new ion microprobe facility, provide further opportunities for collaborative research.

Screening of applicants will begin November 1, 2003, and the position will remain open until filled. Interested applicants should send a full vitae, including a statement of research and teaching interests, several reprints/preprints, and contact information for 3-5 letters of reference to Prof. John W. Valley, Mineralogy Search Committee Chair, Department of Geology and Geophysics, 1215 W. Dayton Street, University of Wisconsin, Madison, WI 53706, U.S.A.

Further information about the search and the department may be found at www.geology.wisc.edu or by contacting Prof. Valley at valley@geology.wisc.edu. UW-Madison is an equal opportunity/affirmative action employer and encourages applications from women and minorities. Unless confidentiality is requested in writing, information regarding applicants must be released upon request. Finalists cannot be guaranteed confidentiality.

**GEOMORPHOLOGY/GUSTAVUS ADOLPHUS
COLLEGE**

Gustavus Adolphus College invites applications for a tenure track position at the assistant professor level in the Department of Geology to begin September 1, 2004.

Teaching responsibilities will include geomorphology, introductory geology, and likely hydrogeology, with an opportunity to develop additional courses (including travel courses) related to specialty. The candidate is expected to engage in an active research program, to generate and supervise senior theses.

We seek candidates who have the Ph.D. and broad training, with expertise in geomorphology, and preferred emphasis in glacial geology. A sincere interest in undergraduate teaching and commitment to the liberal arts tradition is requisite.

To apply, submit letter of application, curriculum vitae, statements of teaching philosophy and research interests, and arrange for three to five letters of recommendation directed to: James Welsh, Chair, Department of Geology, Gustavus Adolphus College, 800 West College Ave., St. Peter, MN 56082. 507-933-7335; welsh@gustavus.edu

Review of applications will begin on November 10, 2003, and continue until the position is filled. Preliminary interviews will be held at the national GSA Meeting in Seattle.

Gustavus Adolphus College is a coeducational, private, Lutheran (ELCA), residential, national liberal arts college of 2500 students located in south central Minnesota, an area of diverse glacial landforms and bedrock. The Geology Department consists of three full-time members. The Department is committed to providing a curriculum for our majors that is field- and research-oriented, and contributes significantly to the general education program of the college.

It is the practice of the College to provide equal educational and employment opportunities for all. We specifically encourage applications from women, minorities, and persons with disabilities.

For additional information visit <http://oncampus.gustavus.edu/oncampus/academics/geology/index.html>, <http://www.gustavus.edu/oncampus/humanresources/index.cfm>.

MINERALOGY, GEORGE MASON UNIVERSITY

The Department of Environmental Science and Policy invites applications for a tenure-track Assistant Professor position in Mineralogy for fall 2004. We seek a dynamic person with expertise in mineralogy and geochemistry. Successful candidate will be expected to pursue an active externally-funded research program, aspire to teaching excellence, and engage in interdisciplinary collaboration. Teaching duties would be primarily at the undergraduate level and will include mineralogy (hand-sample and optical), and other potential courses including geochemistry, soils, hydrogeology, and/or environmental geology. A Ph.D. is required.

The Department offers undergraduate degrees in Geology/Earth Science and MS/Ph.D. in Environmental Science and Policy. Our faculty includes ecologists, biologists, geologists, oceanographers, and policy specialists. Additional information about the Department and University may be found at www.mason.gmu.edu/~essp and www.gmu.edu, respectively. Candidates should submit CV, letter of intent including

statements of research and teaching interests, examples of published work, teaching evaluations (if available), and contact information (with e-mail addresses) of three references to Rick Diecchio, Search Committee Chair, Dept. of Environmental Science and Policy, Mail Stop 5F2, George Mason University, Fairfax, VA 22030-4444. Application deadline is 12 December 2003. George Mason University is an Affirmative Action/Equal Opportunity Employer. We strongly encourage women and minority candidates to apply.

**U.S. GEOLOGICAL SURVEY MENDENHALL
POSTDOCTORAL RESEARCH FELLOWSHIP
PROGRAM**

The U.S. Geological Survey (USGS) invites applications for the Mendenhall Postdoctoral Research Fellowship Program for Fiscal Year 2005. The Mendenhall Program provides opportunities to conduct research in association with selected members of the USGS professional staff. Through this Program the USGS will acquire current expertise in science to assist in implementation of the science strategy of its programs. Fiscal Year 2005 begins in October 2004.

Opportunities for research are available in a wide range of topics. The postdoctoral fellowships are 2-year appointments. The closing date for applications is January 16, 2004. Appointments will start October 2004 or later, depending on availability of funds. A description of the program, research opportunities, and the application process are available at <http://geology.usgs.gov/postdoc>. The U.S. Geological Survey is an equal opportunity employer.

SUNY GENESEO

The Department of Geological Sciences, SUNY Geneseo, solicits applications for two positions at the Assistant Professor level. Teaching responsibilities include both large and small-enrollment introductory-level courses, as well as upper-level courses in mineralogy, petrology, structural geology, and electives that will complement those offered by current faculty. General areas of expertise at present are paleontology/stratigraphy, geomorphology/glacial geology/remote sensing, and hydrology/geochemistry. The Department consists of six faculty members and approximately 50 geology majors, 70% of whom continue to graduate schools.

We seek dynamic individuals who are committed to sustaining an outstanding undergraduate program in the geological sciences. The successful candidates will foster the departmental culture of excellence in teaching in both general education and majors courses, of engaging majors in research projects, and of mentoring and guiding undergraduates through their formative years. A Ph.D. (or ABD) is required. We seek colleagues who are devoted to undergraduate education, who have demonstrated potential to achieve excellence in teaching, an interest in establishing research programs involving undergraduates that result in peer-reviewed publications, a willingness to take an active role in departmental field experiences, and enthusiasm for participating in departmental, college, and public service. Special consideration will be given to candidates with any or all of the following: field-based skills, abilities to maintain our geophysics program, GIS competence, expertise with software technology, and interest in participating in a college-wide writing seminar for freshmen.

SUNY Geneseo is a highly selective public liberal arts college with approximately 5000 students. The campus is located in the historic village of Geneseo in the Finger Lakes region of Western New York just south of Rochester. The college consistently is ranked by several rating services as being among the best public undergraduate institutions in the country. Geneseo is a member of the Council of Public Liberal Arts Colleges.

A 106,000 sq. ft. Integrated Science Facility to house Geology and Biology and to connect with an existing building housing Chemistry and Physics is currently under construction. Although a preliminary equipment schedule has been submitted, purchases will be delayed until the final phase of construction. Thus, the successful candidates will be involved in laboratory layout and equipment acquisition.

Candidates should submit a letter of interest addressing their qualifications for the positions described, curriculum vitae, copies of college transcripts (unofficial acceptable), a statement of teaching interests and philosophy, a statement of research interests in the context of undergraduate education, evidence of effective teaching, and arrange to have three recent letters of reference sent to: Dr. Richard B. Hatheway, Chair, Department of Geological Sciences, Greene 106, State University College at Geneseo, Geneseo, NY 14454

Review of applications will begin December 10, 2003 and continue until the position is filled. SUNY Geneseo is an affirmative action/equal opportunity employer committed to recruiting, supporting, and fostering a diverse community of outstanding faculty, staff, and students.

Opportunities for Students

Structural Geology Assistantship at the University of Kentucky. It is anticipated an M.S. or Ph.D. degree assistantship in the field of structural geology/organic petrology will be available for spring or fall of 2004. The appointment involves a flexible combination of Research and Teaching Assistantships. The Research Assistantship stipend will be \$15,000/year for 2 years, plus health insurance and tuition, and can be supplemented by an additional \$3,000/year for students with the requisite academic qualifications. The project involves a combination of field and laboratory work, using frictional heating of coals on faults in the southern Appalachians, as a paleo-stress indicator on ancient seismic faults. This project is topical and is a newly emerging field in structural geology. The candidate will be encouraged to collaborate with the Center of Applied Energy Research at the Univ. of KY. Candidates may take courses in a wide range of graduate disciplines, including structural geology, seismology, and organic petrology. For further information contact Kieran O'Hara at geokoh@uky.edu, or see our web page at <http://www.uky.edu/AS/Geology/>.

Graduate Assistantships in Ground-water Biogeochemistry/Hydrogeology. MS and PhD assistantships are available for projects in biogeochemical and hydrological interactions related to N transport in karst. Assistantships are available January 2004 in Biological Sciences, Geosciences, or the Environmental Dynamics programs at the University of Arkansas in Fayetteville. One project will define hydrological flow paths and hydrologic budget in karst systems using stable isotopic tracers. A complementary study element will focus on biogeochemical cycling of N: dissolved organic matter, NO_3^- concentration, and stable isotopic compositions will be assessed

to link immobilization and denitrification to hydrologic controls. Results will be applied to field-scale experiments testing impact of common agricultural practices on hydrology and biogeochemistry in karst. Students will gain experience in hydrology and stable isotope techniques, including direct training in the U of A Stable Isotope Lab. Ideal candidates will have analytical and field skills and at least a BS in some field of biology or geology. Contact Dr. Phil Hays (Geosciences: pdhays@usgs.gov; 479-575-7342) or Dr. Sue Ziegler (Biological Sciences; susan@uark.edu; 479-575-6944) for information. Applications (<http://biology.uark.edu/bisc.html> or <http://www.uark.edu/depts/geology/>) due October 1, 2003.

Ph.D. Student Assistantships. Oregon State and Portland State Universities are offering ten Ph.D. research assistantships to explore all aspects of the Earth's subsurface microbial biosphere. Tuition and stipend are provided by the NSF IGERT program and the two universities. Students will work in interdisciplinary teams of engineers, oceanographers, microbiologists, microbial ecologists, geologists, soil scientists, and chemists to solve environmental problems, to understand global chemical cycles, and to determine the impact of subsurface microorganisms on surface ecosystems. More information can be found at: <http://oregonstate.edu/dept/igert>, or Martin R. Fisk, College of Oceanic and Atmospheric Sciences, Oregon State University, mfisk@coas.oregonstate.edu Students from all scientific backgrounds are encouraged to apply to departments represented by IGERT faculty at either institution. U.S. citizens or permanent residents can be supported by IGERT funds however students of all nations can participate in the program. Review of applications starts 1/15/04. Oregon State and Portland State Universities are committed to equality in education.

GSA Fellows

With the help of two other Fellows, or one Fellow and one member, you can nominate a colleague for GSA Fellowship.

For details and a form, please see www.geosociety.org/members/fellow.htm, or inquire via membership@geosociety.org. 800-472-1988, ext. 1017, or (303) 357-1017.

The deadline for nominations is January 15.



GEOSCIENCE DIRECTORY

Books—Used & Rare

Recent, Rare, and Out-of-print Books. We purchase single books and complete collections. Find our catalog at <http://home.earthlink.net/~msbooks> for books on Geology, Paleontology, Mining History (U.S. & International), Ore Deposits, USGS, Petroleum, Coal; e-mail: msbooks@earthlink.net; MS Book and Mineral Company, P.O. Box 6774, Lake Charles, LA 70606-6774.

Journals, Books, and Off-Prints in Geosciences. PaleoPublications specializes in paleontology, mineralogy, geology and related earth sciences. Search through 1000's of items at www.paleopubs.com. Nathan E. Carpenter, PaleoPublications, nate@paleopubs.com.

Contract Labs

Water-Rock-Life Labs—a comprehensive analytical contract facility providing metal analyses on a variety of environmental matrices (e.g., EPA 200.8, EPA 6020) by DRC-ICP-MS. Laser ablation ICP-MS also available. Contact Dr. Robyn Hannigan, 870-972-3086, hannigan@astate.edu; <http://www.cas.astate.edu/geochemistry>.

Imaging

Southwest Satellite Imaging. Affordable custom image processing, optimized for geologic mapping and analyses. 866-230-8941, dohrenwend@rkymtnhi.com.

Maps

Travel Maps—The world's largest online map catalog. Featuring city maps, topographic maps and digital maps worldwide. Call (336) 227-8300 or visit www.omnimap.com.

Science Teaching Aids

Educational products from GSA—Contact us for educator and teacher resources! 800-472-1988, www.geosociety.org/educate/.

Technical Services

Editing and writing service specializing in earth sciences, geology, and environment. Fully web-based at www.earth-research.com.

Travel, Tours, Field Camps

GSA's GeoVentures. Contact Edna Collis, 800-472-1988, x1034, ecollis@geosociety.org; www.geosociety.org/geoVentures/.

Rates

\$55 per month (3 lines of text)
each additional line: add \$15 (max 5 lines)
\$125 for three months
\$250 for six months
\$500 for twelve months
\$25 to activate a link to your Web address per month
Monthly GeoMart listing includes free Web posting
www.geosociety.org
CONTACT
GSA Advertising Coordinator, Ann Crawford
acrawford@geosociety.org
800-472-1988 x1053



New!

Don't Sacrifice Quality for Affordability

At last – a teaching pol microscope worthy of the research lab!

You don't have to sacrifice superb image quality for an affordable polarized light microscope. Leica Microsystems presents the new Leica DM EP, uniquely designed to meet the needs of researchers and teachers who require advanced features not usually available in a teaching polarizing microscope. The DM EP delivers high contrast geological images at a remarkable value.

- Four individually centerable nosepiece positions ensure parcentricity.
- Binocular and trinocular tubes automatically maintain crosshair orientation.
- Convenient flip-in Bertrand lens with pinhole allows easy switchover to conoscopy.
- Offers the brightest illumination in its class – 35W.

Don't plan your next pol microscope purchase without seeing the new Leica DM EP. Call Leica today at 800-248-0123.

Leica Microsystems Inc.
2345 Waukegan Road
Bannockburn, IL 60015

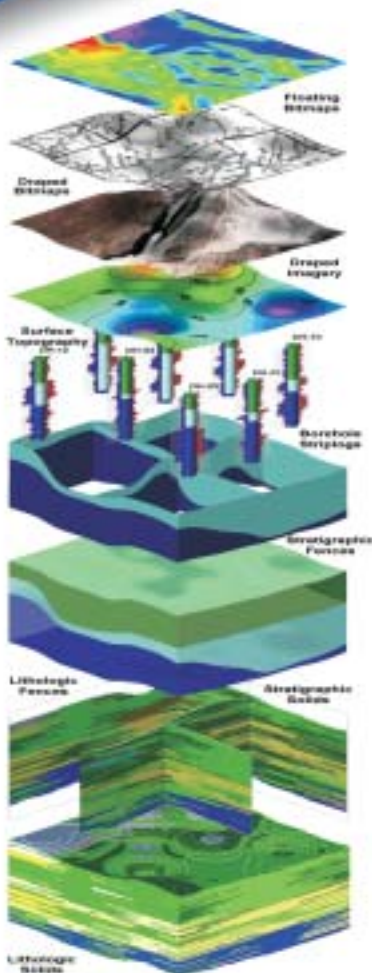
Telephone (847) 405-0123 (800) 248-0123
Fax (847) 405-0184
In Canada call (800) 205-3422
www.discovermicroscopy.com
info@leica-microsystems.com

Leica
MICROSYSTEMS

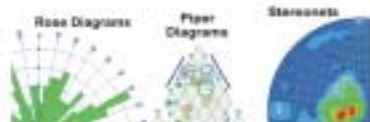
Bringing geology and ArcGIS® together.

RockWorks™

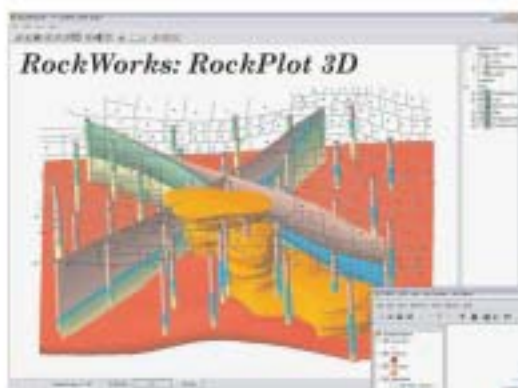
Your Geology Toolbox



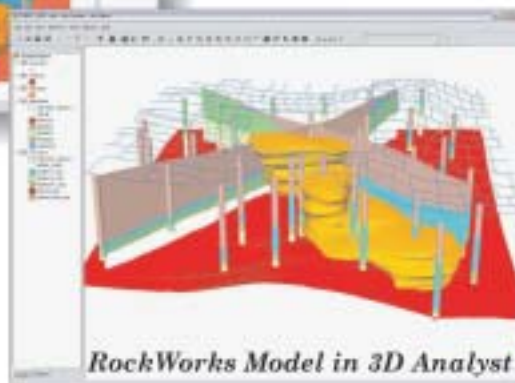
Deviated Drillholes and more!



\$999 Standard • \$399 Academic



Use the RockWorks export feature to transfer your geology model into 3D Analyst.



"ESRI 2003
Denver Region
Partner of the Year"

RockWorks Model in 3D Analyst

Since 1983, RockWare® has been developing and reselling over 200 earth science and GIS software solutions. If you're trying to connect ArcGIS® with geoscience applications; or looking for GIS software in general, give RockWare a call. Our 20 years of experience will get you moving in the right direction.

Over 200 GIS & Earth Science Solutions at: www.rockware.com

RockWare is a registered trademark of RockWare, Inc. All products and names mentioned are the property of their respective owners. RockWare®

Terrain Navigator Pro™



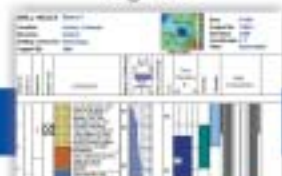
USGS Topos & DOQQs
\$295.00 Per State

RockPack III™



\$875.00 Standard
\$499.00 Academic

LogPlot™



\$599.00 Standard
\$199.00 Academic

SigmaPlot®



\$685.00 Standard
\$495.00 Academic



ESRI
Technology
AUTHORIZED
BUSINESS PARTNER

ArcIMS, ArcView, ArcGIS, 3D Analyst, ArcScene, ArcMap, ArcCatalog, ArcToolbox, SheetMap, ArcPad, ESRI software product logos, and the authorized reseller emblem are trademarks, registered trademarks, or service marks of ESRI in the United States, the European Community, or certain other jurisdictions.

800-775-6745
OR
303-278-3534



RockWare®
Earth Science and GIS Software